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The Farmer's Digest

Volume 4 March, 1941 Number 11

Ladino — The Triple Value Crop

Condensed from New Jersey Agriculture

H. R. Cox

Extension Agronomist

LADINO clover, a variety of the common white clover of our pastures and lawns, closely resembles its relative excepting that it makes a taller and ranker growth. A native of Italy, it first gained a foothold in this country on the west coast where it showed remarkable adaptability under irrigation conditions. About 1929 a dairyman in Massachusetts who had heard about the success of this plant in the West tried out a small seeding. His experience was so favorable that the crop has been spreading rapidly in New England where, strange to say, it has proved to be quite hardy if correctly handled. In 1937 a small planting was made at the North Branch Experiment Station in Sussex County, N. J., and there are now probably 1,000 acres of good Ladino clover in New Jersey.

This new crop is useful for pasture, hay, and silage. There is also prospect of its being useful as an orchard sod crop. Ladino may be considered a short-lived perennial, lasting at least a year and often several years beyond the life of red or alsike clover. On favorable soils and with skillful management it may last as long as alfalfa.

As a pasture plant Ladino appears to be at the top among the legumes in palatability, both for dairy animals and chickens. Also it is highly productive during its life time, much more so than little white clover. In Massachusetts it is considered that a reasonably good Ladino pasture during the spring season of growth will carry eight or ten cows to the acre for about a week, and for the whole pasture season of 150 days it should average about one and one-half cows per acre.

It has been definitely established, however, that Ladino will not stand the close continuous grazing usually practiced on the white clover-blue grass pasture.

Reprinted by permission from New Jersey Agriculture, Nov.-Dec., 1940, New Brunswick, N. J.

Successful grazing of this crop requires rotation management, pasturing fairly heavily, then removing the stock when there are several inches of top still remaining to permit the Ladino to make a full measure of recovery. It is important to let the plant make at least five or six inches of top growth before winter to renew the root reserves. There is some danger of bloat when cattle are turned on a lush growth of Ladino, just as with other clovers. The usual precautions, however, should be sufficient to control bloat.

Since there is always a possibility of encountering poor haying weather and since first cutting Ladino is high in moisture, the farmer who is equipped to put the green material into the silo, if conditions demand, is fortunate. Yields of green material from Ladino sods have varied from a low of eight tons per acre per year in the dry season of 1939 to over 20 tons in 1938 and 1940. These were obtained from either two or three cuttings a year. A practice which many farmers are following is to take off the first growth of the season for hay or silage, then graze at intervals during the rest of the season.

Reports from Connecticut indicate that Ladino can be a useful sod crop for apple orchards, as a substitute for alfalfa.

Ladino clover is always seeded in a mixture with other clovers and grasses. It is usually desirable to include red and alsike clover as well as timothy in the mixture. Some successful growers have included some alfalfa, and if a man is prepared to meet the peculiarities of orchard grass this crop can be a useful ingredient. A mixture sometimes used with spring sowing in New England on an acre basis is: Ladino 2 pounds, red clover 4, alsike 2, timothy 8 and orchard grass 2. As a rule, two pounds of Ladino seed per acre will result in a stand in which Ladino predominates among the clovers after the second year. The tendency is away from including blue grass in the seeding mixture, since this plant as well as little white clover may be expected to come in eventually anyway on a Ladino field used for pasture.

These mixtures may be seeded in small grain, either winter grain or spring seeded grain, in exactly the same manner farmers customarily follow in sowing their grass-clover mixtures. Pasturing off the companion crop of small grain is usually more favorable to the seeding than harvesting the companion crop for grain, hay, or silage. Seeding timothy in the fall with wheat or winter barley, the clovers being broadcast in the late winter, is more favorable to getting a stand of timothy than seeding the entire mixture in the spring with oats. With a fall seeding of timothy the amount of

this ingredient might well be cut down to three or four pounds to the acre. Raw seeding in August of the entire mixture should be quite favorable if a firm seedbed is prepared before sowing. Attempts to get Ladino established on permanent grass pastures, without tillage have not been uniformly successful.

Unlike other clovers and alfalfa, Ladino is comparatively shallow rooted, with a large proportion of the plant above ground in runners, stems, leaves and blossoms. For this reason the plant is at its best on soils which maintain a fairly constant moisture supply. For this reason also the plant appreciates winter protection which may be furnished by a coating of manure applied in the fall. The presence of a fair proportion of grass, say 35%, in the mixture also furnishes considerable winter protection.

Liberal feeding of the soil with fertilizer, and lime if needed, is an essential to high productivity and to lengthening the life of the stand. And with a crop as productive as this it pays to be generous. The essential treatment includes phosphorus and potash materials, and lime if the soil is below pH 6.0. Besides a generous application of fertilizer at time of seeding it probably pays well to apply subsequently at least 300 to 400 pounds per acre of a mixture similar to 0-12-12 every year, or double that quantity every other year. Manure and superphosphate may be used as a substitute for the mixed fertilizer.

Fever Therapy Used on Turkeys

ELECTRICALLY produced fever has proved effective in preliminary studies of the U. S. Bureau of Animal Industry in treating turkeys for a disease of the digestive tract and liver known as trichomoniasis, which is usually fatal. Infected birds were confined in a small chamber heated with electric light bulbs to a temperature that raised the body temperature of the birds to about two to four degrees above normal. After three to six treatments on alternate days, 20 out of 24 turkeys recovered.

—*Electricity on the Farm*

Creep Feeding — A Short Cut to Market

Condensed from Successful Farming

Phil Perdue

WHEN our markets turned definitely toward choice, lightweight, well-finished cattle, stockmen scratched their heads for an answer. America's millions of customers had decided that they preferred small cuts of nicely finished beef, and it didn't seem likely that they would change their collective minds.

Many of the nation's experiment stations began to consider how they could help producers to meet this demand profitably. The feeding of grain to calves in creeps, small feed-lots to which the calves have access but which the cows cannot enter, seemed to offer a logical answer. Calves so fed are fat enough to sell for beef at or within a short time after weaning.

Digging up what they already knew about creep feeding, the experiment stations and some cattle-producers started new tests to determine what might reasonably be expected from this method. Some of the subsequent findings did not agree; many differed on minor points. But on the whole, the results over a long period have shown that, under certain conditions, creep feeding is definitely a practical and profitable feeding method. Under other conditions it may not be.

Creep feeding of lambs and pigs does not seem to be a matter for much debate. Since the idea in feeding early pigs is to get them to eat all they will as fast as they will, creep feeding fits in very well. In fact, today some successful hog-producers are self-feeding their sows as well as their pigs.

Lambs to be sold at weaning time and before hot weather put on quick, cheap gains when creep fed under certain conditions; and it is a short cut to market used to advantage on many farms. Until pasture is ready in the spring early lambs should be fed both hay and grain in the creep in addition to their mother's milk.

Most important of the numerous advantages of creep feeding is bigger gains with less feed and consequently more profit. Creep-fed animals have a better finish, do not shrink as much at weaning time, are more uniform, and usually command higher prices. Creep feeding shortens the dry-lot feeding period and permits earlier marketing when prices are best. Many insist also that creep

Reprinted by permission from Successful Farming, Nov., 1940, Des Moines, Iowa

feeding keeps the mother animal in better condition.

For the producer who is tempted but looking at both sides, there are the disadvantages of trouble and labor, the difficulty in some cases of getting the animals to enter the creep, and the slightly higher market price of grain during the spring and summer. Some producers are finding that creep feeding does not pay when stock is to be sold as feeder-calves because on this market the greatest demand is for thin calves with good quality. Some buyers object to the fatter feeder-calves which have been creep fed.

Let us take briefly the hypothetical case of John Jones, stock-raiser. After weighing the advantages and disadvantages, he, like many others, decides that creep feeding is too good to pass up. So he tries this method of feeding his calves.

But something is wrong. He has trouble all the way around. The calves don't eat as much as they should and consequently don't gain enough extra to pay for the feed costs. He has gone to the trouble and expense of creep feeding with expectations of profits, but it didn't pay.

The trouble was that this setup was not adapted to creep feeding. Even enthusiasts admit that certain conditions must be present or it will prove unprofitable. It is only for those who produce their own grain or those who can get it cheap, and only for the farmers and stockmen who wish to sell the finished product.

Let us assume that Jones met these two qualifications. What else then could have been wrong? Possibly he tried to use "late" calves or calves which were not of high quality. Calves must be early and have quality because only these will have early-maturing beef qualities to be fat enough to sell at weaning or within 60 days after weaning.

December, January, and February calves usually are the most satisfactory for creep feeding; but many, depending upon their location, have success with November or March calves.

Jone's pasture might not have had enough grass, shade, or water. Because his pasture was not suitable, he might have kept the calves in the barn and allowed them to nurse twice daily, but he overlooked this possibility. His feeder may have been located carelessly in a hot place with little grass where the cows would not rest. Also, Mr. Jones might not have given enough attention to other small details. Creep feeding is not as complicated as it may sound, but, like most other practices, it doesn't work ideally unless given a chance.

There are other things necessary to successful creep feeding. High-quality feed should be used and the calves taught to eat grain before they go on grass, if

possible. This latter greatly simplifies the task of getting the calves to enter the creep.

The creep should be situated in the natural resting place of the herd. It frequently pays to delay placing it until a study has been made of the herd's habits. A creep near water and under shade attracts the calves.

It may be necessary to herd the cows up to the creep daily until the calves have become accustomed to feeding there regularly. Large pastures may need more than one creep.

Creeps may be made of wire, boards, or poles, and should be large enough so that the animals are not crowded. Entrances can be made at each corner or along the sides. These openings should be 16 to 22 inches wide; big enough for the calves but too small for the cows. A cross piece at the top of the entrance posts prevents the cows' spreading them.

A feeder may be a trough or self-feeder; it should be low enough for the calves and raised as they grow. A self-feeder eliminates a great deal of labor. Lambs, unlike calves and pigs, however, will not satisfactorily use a self-feeder because of their dislike of messed-over feed.

Oats or a mixture of whole oats and cracked corn may be eaten by calves more readily at first than shelled corn, altho shelled corn is usually the basis of creep rations. Shelled corn adds fat, is attractive to calves, and stands weather well. Oats are too bulky to produce the desired finish if they make up more than one-fourth of the ration after the first 30 to 60 days.

Threshed ground kaffir, milo, or darso has been used to advantage in some grain sorghum-producing sections with reports that they are 90 to 95 percent the value of corn. But, in general, the sorghums contain less fat, more protein, and fewer nutrients than corn.

Ground barley and ground corn also have been used in mixtures with some other grains. Cottonseed meal and cottonseed cake used as one part to six or seven of grain have proved desirable.

Tests over the Midwest show that calves will consume from 5 to 15 bushels of grain from the time they start eating until they are weaned in the autumn. At Nebraska, Kansas, Missouri, Oklahoma, and other stations it is generally agreed that each bushel of grain consumed in the creep will produce about 10 pounds additional weight, and the animals thus fed will bring better prices. A calf which eats 10 bushels of grain before weaning is usually 100 pounds or more heavier at the end of the period than he would normally have been if he had not been creep fed.

Even tests on range calves at

the Texas station showed that creep feeding produced calves worth nearly $10 more per head than the calves on grass alone. At Colorado, creep-fed range calves which were later finished in dry lot had an advantage of 18 pounds in weight and 50 cents per hundredweight in selling price.

While creep feeding is praised by most who adopt it, it is not in general use. Many authorities believe it is something which will never be overdone. Perhaps for the large-scale producer on cheap land the cow and the feeder-calf are his best possibility. However, other producers on higher-priced land will find the competition too keen to produce only an average-weight calf selling at the time of the big fall runs. He has too many dollars invested to make it profitable. He must produce a superior product, and creed feeding may be his answer.

Chicks Need Room

THE figures given below support our oft-repeated admonishment not to start over 300 chicks under one brooder or in one pen and to allow plenty of room for the chicks. They are taken from an economic survey of the broiler industry in western Indiana.

These figures show a constantly increasing mortality and cost with increases in the number of chicks kept in a pen, and a decreasing rate of growth.

When ½ sq. ft. or more of floor space was allowed per bird, the mortality was 10.8%; when less than ½ sq. ft. was allowed, the mortality was 15.1%.

Chicks Per Pen	Number Broilers	Percent Mortality	Cost per pound	Feed per lb. of grain	Gain per day per 100 birds
250 or less	7,800	5.1	18.8c	4.1	3.01
251-349	63,400	11.0	19.1c	4.6	2.94
350-449	76,000	15.3	19.3c	4.9	2.88
450 and over ...	18,200	19.1	20.0c	4.7	2.20
Total	165,400	13.7	19.2c	4.7	2.82

—*American Poultry Journal*

Making Pastures Pay

Condensed from Better Crops With Plant Food

Earl Wooddell Sheets

Washington, D. C.

EVER since the first stockmen came to America, they have recognized the tremendous pasture resources of this country. In earlier times because land for grazing and farming was apparently unlimited, not much attention was given to its conservation. On the other hand their ancestors in the British Isles and eastern Europe, because of the limitation of land per capita, had made much more intensive and efficient use of it. Consequently, over there much more attention had been given to pastures.

The stockman is regarded as the keeper and guardian of grass. It has been his benefactor in every land. Wise stockmen strive to keep the land productive and rich. While livestock contribute to the improvement and upbuilding of poor and unproductive land, a profitable livestock business does not survive for any length of time upon land that is not classed as good or better.

Occasionally it is stated that stockmen are guilty of over-grazing and abusing pastures and range land. This is true in exceptional cases, but to say that it is practiced to any appreciable extent is not based on fact. The big majority of livestock farmers know that their profits come from animals that receive good care and an abundance of good grazing at all times.

Most stockmen have had to contend with three forces which have made their role as conservators of land resources a most difficult one. While the more important of these are running water and wind, the one which has plagued him constantly is the plow. From the time when the first cleared land was plowed for crops, to the breaking up of the vast grass-covered plains of the West, he has suffered from the action of those who sought subsistence or greater gain from the land where grass roots once securely held the topsoil against the action of wind and rain.

Stockmen generally know that a good grass sod erodes much more slowly than would the same land in corn, cotton, tobacco, or similar crops. This information to some has been an obstacle to pasture improvement; in exceptional cases it has lulled indi-

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vidual stockmen into a sense of false security. Giving grazing land practically no attention, putting out but little if any expense, with never a thought of restoring the fertility which has been removed annually, have been responsible for the statement, "My pastures seem to be running out."

The wise and successful farmer and stockman knows that the development and improvement of pastures is an investment in his business. Returns, to a very large extent, depend upon a few very definite procedures. The most significant for profitable results include:

1—Selection of suitable land; thoroughness and accuracy in planning and establishing new pastures.
2—Thoroughness and methods of renovating old pastures.
3—Quality and adaptability of seed mixture, and the time and method of seeding.
4—Kind and amounts of plant nutrients or fertility added, and the time and method of application.
5—Management practices employed at all times which contribute to the establishment, maintenance, and continued use.

For Greatest Returns

To get the greatest possible return from the time, labor, and money invested in pastures, it is necessary that the different steps in development or improvement be correlated. Finding money to invest in pastures is difficult many times. But most stockmen like to make money, and when it is generally known that for every $1.00 invested in the right manner, at least $1.50 and often as much as $3.00 or more will come back in return, there are but few who will not find some way to make the investment.

The exact procedures for establishing new pastures or renovating old pastures depend upon local conditions. The best guide is the experience of stockmen in the community who have successfully established and used such pastures. Most county agents have the most reliable methods and procedures to be followed, and should be consulted. Generally, the first thing to determine is whether the new pasture is to be permanent or annual. Most farms need more of both kinds.

In the North, cereal crops such as oats, wheat, barley, rye, or combinations with peas are used to supplement pastures in the spring, fall, and early winter. Italian rye grass, sudan, Japanese millet, alfalfa, and the clovers are used with success in midsummer and fall. Soybeans are used to special advantage alone or with other crops, but oftentimes they yield greater returns as a harvested crop. In the South, many of the same crops are used, and also vetch, crimson clover, peanuts, and many others for length-

ening the grazing periods in spring and fall or supplementing pastures at other times.

Annual Pastures—Pro and Con

Annual pastures afford greater insurance against parasites, fit into the rotation readily, distribute the benefits of grazing animals more uniformly over the whole farm, and as a rule yield more nutrients per acre. On the other hand, such crops require much more labor and seed than permanent pastures, are not so effective in controlling erosion, and are somewhat less dependable than permanent pastures, since in many areas one has annually the risk of not getting a good stand. Generally it is advisable to have both permanent and annual pastures, with the permanent pasture furnishing the bulk of the grazing, and the annual pasture being of such size, kind, and time of seeding that it furnishes an abundance of grazing while the permanent pasture is dormant or otherwise not available.

The selection of fields for permanent pastures requires considerable thought and care. Good land should be chosen. Of such land, in general that most subject to erosion should be used. It is becoming evident that successful farmers are not only aware of the importance of selection of the fields, but also of the necessity for using proper methods in preparing the seed bed, selection of a seed mixture adapted to the region and the farm, as well as the time of seeding to be most sure of getting a good stand.

Establishing New Pastures

The wise farmer is also aware of the importance of inoculating certain legumes, liming the soil, and applying the kind and amounts of fertilizers to give the greatest return on the investment. Most of the considerations for improving old pastures apply with equal emphasis to establishing new pastures and include:

1—Using nurse crops. Nurse crops are like weeds, sometimes taking more from the newly seeded pasture than the benefits derived from them. Such crops as oats and barley have value when properly handled and should be considered. It must be remembered that they compete with the newly seeded pasture for light, moisture, and plant nutrients. They shade and keep the ground cool and moist, so that the young plant may survive periods of seasonal adversity. Then, too, such crops help hold the top-soil in place while the young grasses and legumes are becoming established.

2—Giving the new pasture a chance to get established before the stock are turned on. Overgrazing leaves unpalatable plants to crowd out the palatable ones. Overgrazing also aids erosion. On the other

hand, undergrazing may permit the grasses to smother or kill certain legumes.

3—Controlling running water by the use of broad, level, contour terraces, constructed in such a manner that when grassed over, they may be clipped with a mower for greatest economy and satisfaction.

4—Applying lime where needed, and the proper kinds and amounts of fertilizers at time of seeding.

Many farmers are conscious of the value and importance of doing something to improve their pastures already established, but are somewhat in doubt as to the steps which should be taken to get most profitable returns. They are oftentimes unaware that failure to complete all phases of the improvement plan renders some of their efforts ineffective and useless.

In improving established pastures there are some very definite procedures.

1—A mower always pays big dividends. It should be used every year, several times if necessary, to keep down weeds and brush, and to protect young legumes and grass from being smothered or killed out.

2—Reseeding to legumes and grasses as required, using seed adapted to the region, and seeded at the proper time.

3—Establishing broad level terraces or strips over which a mower will pass. They hold the water and are clipped with economy and satisfaction.

4—Top-dressing the pastures with lime when required, and fertilizers adapted for the purpose and in proper amounts. Stable manure is useful but usually gives greater returns on crop land.

5—Controlling grazing at all times, neither overgrazing nor undergrazing for best returns.

It should not be expected that the full measure of returns from these practices will be attained the first year. It will be noted that the cash investment required is very small indeed. The principal requirements are careful planning, considerable initiative, and a lot of hard work.

One of the most troublesome questions in renovating old pastures is how to do it effectively and completely without breaking the sod or reducing its grazing value during the first year. That is difficult to do, as the young plants must be protected from overgrazing as well as undergrazing. The first rule is to take care of the legumes, and they will help take care of the grasses. The legumes furnish nitrogen and organic matter, while the grasses shade the ground and protect the young legume plants.

Remember that white clover or lespedeza added to a grass sod,

fertilized and properly protected, will at least double the carrying capacity of the pasture and oftentimes treble it, not for one year but for many years. The legume pasture is more succulent, is higher in protein, contains more essential minerals and vitamins, and when grazed by milk cows improves the color and quality of the milk.

White clover and lespedeza may be established in old pastures without plowing the slopes or destroying the grasses, either by harrowing with a spike tooth or disk harrow set so as not to loosen the sod completely. Fertilizer and lime should be applied, perferably at the same time, to be sure that they are not overlooked. Grazing is withheld until plants are well established, which with spring seeding means about August 1 in most seasons. A mowing machine is necessary to do a good job of holding the weeds in check.

Before we knew as much about pastures as we do today, the common practice was to use a "shotgun mixture" made up of a number of grasses and legumes, both for seeding new pastures and reseeding old ones. The principal value of a mixture was, of course, that with the usual variation of soil, moisture, and other conditions, and not knowing the quality or adaptability of the many new grasses or legumes, somewhat better results in obtaining a stand were assured. Then too, it was generally known that a mixed legume and grass pasture is more palatable, comes earlier in the spring, furnishes more grazing during dry weather, and also in the fall.

The Leading Pasture Legume

White clover easily takes first rank as the leading pasture legume, with lespedeza predominating on lighter soils in the Southeast. There are a number of varieties and selections used, but in general it thrives best on good soil, rich in minerals and humus, and where there is considerable moisture. White clover is a surface feeder and subject to climatic adversity. As a grazing crop it is just about ideal, in that stocking it rather heavily at its best holds it in check and at the same time assures its survival. In the British Isles a pasture well stocked with white clover is given a 50 per cent higher rating or value than one without.

During the twenties when the late J. R. Ricks, Dean and Director of the Mississippi State Agricultural College and Experiment Station, was helping us in an effort to make the South pasture conscious, he told me as we were going over the good pastures there, which are on the edge of the good grass *region* sometimes spoken of as the Prairie or Black Belt, "Twenty-five years ago when we began to build these pastures, we did not know as much about the adaptability of

certain grasses and legumes as we do now. As a result we have at different times added most of the many which were thought to be useful."

It was interesting to note that while many other grasses and legumes had come and gone, there were about a half dozen that always furnished the bulk of the grazing throughout the year. These were, in the order of their appearance, rye grass, hop clover, white clover, Dallis grass, Bermuda grass, and lespedeza.

In the light of the experiences of recent years, the need for simple pasture mixtures is very apparent. The time should not be far off when we can, and in fact do today for most localities, select the few grasses and legumes that give greatest returns when making pasture investments.

Good Management Important

Many times pastures are improved by including a number of the clovers and alfalfa, as well as such grasses as orchard grass, red top, and many others. It takes good management to hold the desirable grasses and legumes and eliminate the less desirable kinds. It is well known by stockmen that continuous or over grazing soon kills out such grasses as orchard grass, red top, timothy, Johnson grass, and others, leaving in the more humid regions such persistent ones as blue grass, Bermuda grass, carpet grass, and Dallis grass. Kentucky blue grass in the regions to which it is adapted is to a good sod in America what perennial rye grass is to the pastures of Europe.

Farmers who sell crops know that they remove from the soil and take from the farm annually the amounts of nitrogen, phosphates, and potash which the crops contain. There are but few farmers who do not also know that when selling meat animals or work stock or dairy products, they remove much less than when selling the crops direct.

A ton of beef, pork, lamb, or work stock removes on the average annually from the soil the equivalent of about $12.50 worth of fertility. Expressed another way, if the pasture produces 100 pounds of beef per acre annually, it would be necessary to apply at least 275 pounds of superphosphate and 250 pounds of muriate of potash every 5 years to maintain the plant nutrients in the soil. At the current prices this would represent an annual investment per acre of not more than $1.50.

When selling whole milk and veal calves, the drain on the pasture is even greater than selling meat animals alone. A good milk cow producing at least 5,000 pounds of milk would remove during the year the equivalent of at least 125 pounds of nitrate of soda, 50 pounds of superphosphate, and nearly as much muriate of potash and limestone.

In general it may be said that sick or undernourished pastures are like poorly fed animals; before they will thrive they must have more feed and care. When a pasture is smothered by weeds, has a scanty, grub-infested sod, and where there is a known deficiency of plant nutrients, it is in great need of help.

In applying fertilizers to pastures there are some well-established principles to be remembered, if the greatest return on the fertilizer investment is to be obtained:

1—It pays to top-dress or apply fertilizers on the best soils first.

2—Application should be made 2 to 8 weeks before grazing is to begin, depending upon the kind and amount, if any, of the nitrogen carrier used.

3—Enough fertilizer should be applied to bring full returns on the investment. As a rule 500 to 600 pounds of a 4-8-8 or equivalent to start is sufficient. On land heavily stocked or grazed, more nitrogen will be required.

4—The area should be fenced so as to control grazing, care being taken to avoid both over and undergrazing at certain periods, and never until the plants from the new seeding have become established.

5—Lime may be added at the rate of 1 to 2 tons per acre, if required. Ordinarily fertilizer is applied first, and the increased profits more than pay for the lime.

6—Pasture fertilization usually increases the amount of pasture early in the spring and during the late fall months. Pasturage during the dry months of the year is attained largely by the introduction of grasses and legumes adapted to the purpose for any particular region, and more certainly by forage crops grown especially for the purpose.

7—Best results are usually obtained when nitrogen fertilizers are applied annually, and the potash and superphosphate every third year. On the average when fully stocked every $1.00 invested in fertilizer when applied to pasture on good land has given in return $1.50, or increases varying from 50 to 200 per cent on the investment.

8—Good results may sometimes be obtained by applying a complete fertilizer alone as a top-dressing to a run-down, unproductive pasture without reseeding or taking any of the other steps for improving it. Desirable legumes will begin to appear and the less desirable ones gradually disappear. To encourage white clover, potash and superphosphates should be applied and close grazing, but never overgraz-

ing, should be practiced to keep the grasses from shading and crowding or smothering it out.

In fertilizing pastures, whether newly seeded or established or old pastures, it is important to give due consideration to the principal plant nutrients, whether they are applied separately or as a balanced complete fertilizer. The 4-8-8 furnishes enough nitrogen to make the grasses jump, so that they shade the legumes until they become established and begin to feed the grasses. The results from superphosphate and potash are usually much slower. Oftentimes the full returns do not begin to be received until the second and sometimes the third year.

One of the principal purposes and values of the potash is to insure and maintain a good stand of white clover and some of the other legumes. Potash is known to be needed on low bottom land, mucks, and dark colored sandy and clay loams. While each of the plant nutrients has special qualities of adaptation and use to recommend it, in many places it has been established that a well-balanced complete fertilizer gives better returns than any one of them used alone.

New Small Pumpkin

A small pumpkin, large enough for just one pie, has been developed at the U. S. Department of Agriculture field staton at Cheyenne, Wyo. Called Early Cheyenne, the new pumpkin is only two to four inches in length and from five to seven inches in diameter.

One of the main reasons for development of the new, smaller pumpkin is the practice followed by many a homemaker of cutting an ordinary-sized pumpkin, using only a part of it for pie, then finding that the remainder of the pumpkin goes stale when an attempt is made to save it.

Early Cheyenne is a heavy bearer. Tests at the U. S. Department of Agriculture station showed that Early Cheyenne averaged about nine fruits to a vine; commercial New England Pie, about five fruits; and Connecticut Field, about three fruits. In storage, Early Cheyenne keeps about as well as the other two varieties. As yet seed for home and market gardeners is not available.

—*New Jersey Farm and Garden*

The Purebred Dairy Cattle Association

Condensed from Guernsey Breeders' Journal

Ira G. Payne

THE five dairy breed registry associations recently organized under the name of The Pure Bred Dairy Cattle Association.

It would seem that there are now enough organizations in the dairy and agricultural world to look after our interests. But there are none to speak for and work for and, if necessary, fight for the pure bred dairy cattle industry as a whole. That, roughly, is the purpose of The Pure Bred Dairy Cattle Association, which is composed of The Ayrshire Breeder's Association, The American Guernsey Cattle Club, The American Jersey Cattle Club, The Brown Swiss Cattle Breeder's Association and the Holstein-Friesian Association of America.

If one is a typical pure bred dairy cattle breeder, he has four neighbors, one on each fence line of his farm, who are using grade bulls at best, scrub bulls at worst. Every pure breeder of dairy cattle has the same typical neighbors, whether he is breeding Ayrshires, Brown Swiss, Guernseys, Holsteins or Jerseys.

America's pure breeders of dairy cattle have, according to the best estimates, less than 100,000 registered sires in service. The Federal Bureau of Dairying tells us that there are 432,000 dairy herds of eleven or more cows in the United States. We may infer, therefore, that about 340,000 dairy herds of eleven or more cows are headed by bulls of doubtful or unknown origin or ancestry, at least whose identities cannot be definitely established with any recognized breed association. At first glance, the situation is alarming. Why don't more American dairymen own registered sires, not to mention registered females? Must we arrive at the conclusion that all our effort, investment and idealism in and for the pure bred dairy cow has been in vain? Is there something wrong with the pure bred ideal?

Because of our years of testing cows generation after generation, and proving bulls and families, we are in a position to offer these 340,000 dairymen, who are using nondescript bulls, herd sires that will sire cows that will produce for them not only greater but more economical amounts of milk and butterfat. Perhaps the worst thing our breeders and pure bred registry associations can be accused of is a poor job of selling,

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for we have irrefutable evidence of the superiority of the pure bred in the fact that, while the average butter fat production of all pure bred dairy animals of all breeds is rapidly approaching the 400-pound mark, as calculated from unselected herd tests by the major breed registry associations, the average of run-of-the-farm cows is below 200 pounds, according to the United States Department of Agriculture. Of course, we admit that many grade cows have creditable individual records and a number of high-producing grade herds can be pointed to as proof that some good grades with good feed and care are capable of milk pail performance on a par with pure breds. "Good Grades," however, are usually close-up descendants of pure bred ancestors. Often, they have lost their pure bred identity through failure of someone to register one or more immediate branches of their family trees. The modern, profitable dairy cow, whether registered or grade, owes her high producing ability to pure bred ancestors.

There may be some grade dairymen who prefer their grade cattle to pure breds. I have never met one. Those to whom I have talked usually have a "hankering" some day to get a pure bred herd sire, perhaps a few registered heifers, to start a pure bred herd. That's the way some of our most outstanding breeders of today had their beginnings. By and large, I know that the grade dairymen of America (perhaps not all 340,000 of them, but a sizeable portion of that number) admire pure breds and envy the pride that only pure bred owners derive from their herds. They wish that they, too, could own registered cattle, both for the added profit and the pleasure that pure breds provide.

It is promising if we are sufficiently enterprising to capitalize upon the fact that we have something to sell that others need and want to buy. We, then, have a job on our hands to take the grade dairyman's admiration for pure breds, his envy of us, and his need for the pure bred herd, and translate those factors into a tangible demand for our surplus registered stock.

Let's face a few more facts. Promising young pure bred bulls are begging for buyers, while too many commercial dairymen are picking out their herd sires at the slaughterhouse. Breeders of all breeds are "knocking bull calves in the head" for lack of buyers, yet 700 dairymen in one county alone are using stockyard bulls to head their herds. In another dairying county, there are more than 500 stockyard bulls in service.

During the coming year, one-third of a million pure bred dairy bulls of all breeds will be born in the United States. Only about

one out of ten of those pure bred bull calves will be registered, because we register only those bulls for which we have use or a market. As long as males constitute roughly half of our annual calf crop, and as long as our market for pure bred bulls fails to expand, just so long can we expect that inexorable rate of preponderance of pure bred bull births over pure bred bull sales to continue, year in and year out. That is, unless we do something to change it—do a job mutually beneficial to the hundreds of thousands of dairymen who need good bulls, and to the breeders who have those good bulls to sell.

This co-operative program of the five dairy breed associations is predicated upon the sincere desire to accomplish this result with a sound understanding of the purposes and principles involved.

May I briefly outline some of our objectives?

1. *Exchange of Information:* There have been a few misunderstandings in the past, traceable, for the most part, to a lack of knowledge concerning the different breeds. I refer particularly to quoting figures in a standard fashion on such matters as number of pure breds in the United States, records of production for different ages and classes of both cows and bulls, and other similar facts that could be constructively utilized. Such standard procedure, we hope, would not only be used by our breed associations and farm papers, but passed on down the line by the breed secretaries to their field-men and workers. The same uniform information to be furnished to and used by all extension men and agricultural teachers.

2. *Negative Statements and Destructive Criticism:* No derogatory statements or destructive criticism should be made against its contemporaries by any breed in any speech or conversation of an official nature, or in any advertisement, news article, piece of literature or display. It is conceded that much good can be claimed for any breed. It is admitted by all that each breed has its place. We acknowledge further that the critical can sometimes find something uncomplimentary to say about another breed, but it is better left unsaid. Prospective pure bred breeders are often discouraged from starting by the conflicting and bewildering charges made against other breeders by overzealous breeders and agents of a given breed. Neither by innuendo or inference, nor by direct or indirect statement, should one breed be unjustly or unfairly compared with another.

3. *Co-operation of Breeders:* Realizing the program is, to a large degree, dependent on the support of the breeders of all breeds, their assistance will be enlisted. Each breed Secretary is

responsible for informing his field-men, state clubs and breed papers. They, in turn, pass on the information so that their breeders will be convinced that they will be helping themselves most in the end when they are at least fair to all breeds. An example of the possibility of better breeder co-operation is in the prize money allotted at shows. At some fairs one breed group opposes another breed group in obtaining appropriations for prize money. How much better if a uniform policy were formulated as to the division of prize money and then all breeds concentrated their efforts and co-operated to the end that prize money be generally increased, instead of arguing over who will get the lion's share.

4. *Co-operative Exhibits:* At the National Dairy Show and other leading fairs, there is a good opportunity for inter-breed co-operation. Up until this year, however, through no one's especial fault, a rivalry, expensive to each breed association, had grown up. The charge has been made, and to a certain degree justified, that instead of exhibiting our breed in the ring and displaying it most advantageously to the public, which should have been our chief objective, we were competing for attention to our displays, literature and animals. A certain amount of breed advertising is essential, but it should never be promoted to react to the detriment of pure bred cattle as a whole or reflect on the relationship between breeds or breeders. Those who attended the National Dairy Show at Harrisburg in October, witnessed our first attempt at a co-operative effort to display the value of the pure bred dairy cow. Judging from the large numbers of interested spectators and the comments, together with reports, which we have read in farm papers, we believe it was effective. It is hoped to make such a co-operative display in behalf of pure breds at some of our leading shows next year.

5. *Advertising and Publicity:* At the present time we have no funds for buying advertising space. We regret this, but our organization is young and developing gradually. Eventually, we expect to have something in our budget for that purpose. In the meantime, the publicity men of our various breed associations will, I am sure, co-operate for the principles previously set forth, realizing that in any increase in sales of, or interest in, pure breds, each breed will reap its share of the business. This is the principle on which all trade associations operate and it has been proved sound and profitable.

An intelligent and vigorous attack upon the disparity of pure bred sires in the national dairy picture is the chief objective of our program. Increased use and sale of pure breds will inevitably

follow and benefit all concerned. It seems unnecessary, however, to caution that we must not expect to sell a lot of surplus bulls immediately. This is a long range program, somewhat experimental at the start. We cannot take it for granted that the 340,000 grade dairymen will recognize immediately the superiority of pure breds. Our case must be presented to them anew, convincingly and dramatically. Education and demonstration must precede salesmanship and when we replace a scrub bull with a pure bred, no matter what the breed, we can be confident that we are contributing to the welfare of that dairyman in particular, and to dairying in general.

Vitamins for Health

Condensed from American Poultry Journal

CONSIDERABLY more is known about vitamins today than when they were discovered approximately thirty years ago. Many of the vitamins are known chemically and are thoroughly understood. New vitamins are constantly being discovered, and, in fact, since some of the vitamins have been split up into several parts, there is a tendency to refer to them as factors rather than as vitamins.

Not all of the known vitamins or factors have any direct bearing on the health of poultry.

Vitamin A, known technically as the anti-opthalmic vitamin, is needed by chicks for growth and by adult birds to maintain good health, egg production, and hatchability. A severe vitamin A deficiency gives the birds the appearance of having roup. There is a discharge from one or both nostrils, swelling of the face around the eyes, and the eyelids may be glued together by a discharge from them; yellowish white, round, cheesy patches about the size of a pinhead may be seen in the mouth and throat.

A post mortem examination of birds that die as a result of vitamin A deficiency will usually show that the kidneys are very pale and marked with a network of fine white lines and there are occasional deposits of white material on the surface of the liver, on the membrane around the heart, or elsewhere on the surface of the organs.

Birds that are fed a ration deficient in vitamin A show a general unthriftiness accompanied by

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physical weakness, loss of appetite, diarrhea, and a marked retardation in growth and development.

Sources of vitamin A are green grass, alfalfa, good quality alfalfa meal, kale, yellow carrots, and fish oils. All of these materials except fish oils are really sources of carotene, which is changed in the liver to a colorless form of true vitamin A. Vitamin A is also obtained from yellow corn, but here the source of vitamin A is what is known as cryptoxanthin, which is changed to true vitamin A inside the body.

Investigators have found ways of measuring the amounts of some of the vitamins needed by various classes of poultry. For example, it has been found that the total ration of growing chicks should contain not less than 1500 U.S.P. (United States Pharmacopea) units per pound of feed, and 2250 units in the total feed of laying stock will provide enough for health, production, and good hatchability. To produce eggs of high vitamin A content, 4500 units per pound of feed are necessary. The requirements for turkeys are approximately twice those of chickens. It is well to bear in mind that vitamin A will lose potency during storage and that the rate of loss will depend on the ration, temperature, storage conditions, and length of storage. Commercially mixed feeds put out by reliable manufacturers contain sufficient vitamin A to afford protection even after a considerable storage period has elapsed.

Vitamin B has been split into several different groups. The one that is of interest to poultrymen is vitamin B1, or the antineuritic vitamin, chemically known as thiamin. A deficiency of this vitamin involves the nervous system; young birds are most likely to be affected. Affected individuals show weakness, particularly of the legs, with loss of weight, incoordination, and jerky movements of the neck and legs. The chief sources of this vitamin are whole grains and wheat by-products, and since practically all good rations contain these in some form, the poultryman will find that his flock is usually not subject to a deficiency of this particular vitamin. It has been found that poultry rations should contain approximately 175 International Units of this vitamin per pound of total feed.

Vitamin D, or the antirachitic vitamin, also called the sunshine vitamin, is necessary to prevent rickets in growing chicks and to prevent a condition often known as egg paralysis that accompanies the production of soft shelled eggs in laying birds. It must be understood that in addition to the necessary amount of vitamin D, the calcium and mineral content of the ration must be supplied to chicks and adult birds in the

necessary amounts for the purposes for which they are used. Weak legs, ruffled feathers, and general unthrifty condition are typical. This deficiency shows up between the 4th and 10th weeks of the brooding period.

The chief sources of vitamin D are fish liver oils, such as cod liver oil and sardine oil and additional oils that are being found available for this purpose from time to time. Although the minimum amount of vitamin D required to prevent rickets is about 90 A.O.A.C. (Assn. of Official Agricultural Chemists) chick units per pound of total ration, it is best to include 180 units per pound of total feed. Practical laying rations should contain not less than 360 units (AOAC) per pound of total feed. Experiment work with turkeys indicates that the vitamin D requirements of poults during the first four weeks of life is about ten times that of chicks.

It is well to point out that direct contact with the ultra-violet rays of the sun enables chickens to produce within themselves the necessary vitamin D, enabling them to make the best use of their feed. Glass substitutes in poultry house windows, therefore, or special glass permitting ultra-violet rays to enter, are of value in this connection. The same effects also can be obtained by the use of artificially produced ultra-violet rays from an electric arc or mercury vapor lamp, or from the new type S-4 lamps that are simply plugged into electric light sockets. In the latter case, a special transformer is needed for use in poultry houses.

A condition that should not be confused with leg weakness is what is known as perosis, or slipped tendon, in which the legs are bowed or twisted in spite of the fact that the bones are well calcified and hard. This condition is likely to occur after the fourth week of brooding. Excessive amounts of minerals appear to be the chief cause of this difficulty, primarily a poor calcium-phosphorus balance in the ration. Manganese, however, seems to contain a factor that helps prevent this, and only very small quantities are needed—as little as an ounce and a half per ton is all that is needed for this purpose. Most commercial feeds at the present time contain manganese which is helpful in preventing perosis.

Vitamin E contains the anti-sterility factor. The results of certain experimental work seem to show clearly that vitamin E is essential for normal reproduction in hatching. Also, it has been shown that young chicks reared on a vitamin E deficient diet from the time of hatching develop a condition of imbalance and loss of muscular control about the third week. Such chicks are found staggering around the pen or lying on their

sides. This condition is due to a hemorrhage and a disintegration of a portion of the chick's brain. All whole grains and many green feeds are the source of this vitaman, although wheat germ oil is the most concentrated source of vitamin E. Under conditions of vitamin E deficiency, the addition of wheat germ oil, which supplies vitamin E, will undoubtedly prove beneficial in increasing hatchability.

Vitamin G, or riboflavin (sometimes referred to as lactoflavin), is frequently referred to as the antinutritional paralysis factor. A deficiency of this vitamin results in nutritional leg paralysis in growing chicks due to degeneration in the nerve tissue and results also in reduced egg production and lowered hatchability in mature hens. In addition to the curled toes, chicks affected with this vitamin deficiency will walk on their hocks and appear unable to stand on their feet. The importance of this vitamin in the ration of breeders can be seen in the fact that many of the chicks that are hatched from eggs that have come from hens on a partially deficient riboflavin ration show this curled toe condition upon hatching. Thus, a deficiency of this vitamin in the diet of breeding hens is reflected in the riboflavin content of the eggs which in turn affects the embryonic growth and conditions of the chicks at hatching. Sources of vitamin G are milk products, animal liver meal, yeast, and alfalfa.

Vitamin K is known as the anti-hemorrhagic factor and is required by chickens to preserve the clotting power of blood. In the absence of this vitamin, chicks bleed to death from any injury causing a rupture of the blood vessel walls. Practically, the poultryman does not need to worry about this vitamin in poultry feeding because feed stuffs, especially greens or alfalfa and cereal grass meals that contain the vitamin are in wide use. Neverthless, it is of interest that research work involving this vitamin that has been done with chicks finds practical application in the human medical field.

Another vitamin in connection with poultry feeding, that to date has not been assigned a letter, is known as the filtrate factor, also as pantothenic acid. Scabby lesions on the margin of the eyelids, at the corners of the mandibles of the beak, and on the feet are characteristic. These lesions sometimes also appear around the vent. Sources of this vitamin are milk by-products, liver meal, green grass, or cane molasses. At any rate, rations that include fairly liberal amounts of these products will provide adequate amounts of this vitamin.

Crazy chick disease is thought to be caused by a vitamin or factor known as the antien-cephalomalacia, or crazy chick fac-

tor. According to one investigator, there is a possibility that a lack of vitamin E may also be responsible, to some extent, for this condition. The difficulty seems to be due to breaking down of the cells of the cerebellum and the cerebrum of the brain of growing chicks. This difficulty is likely to show up when chicks are about 3 weeks of age. Feeds that seem to contain this factor and offer protection against this difficulty are cereal grains, good quality wheat by-products, alfalfa meal, and green grass.

Another vitamin or factor difficult for the average poultryman to identify, is what is known as the anti-gizzard erosion factor which prevents eroded areas or lesions and roughening of the lining of the gizzard of chicks. This factor is still being studied by investigators, and it appears that from the laboratory end, bile, bile salts, or cholic acid are effective in preventing these lesions. Practically, it appears that alfalfa meal, green grass, and wheat by-products are effective under certain conditions.

New information about vitamins is continually coming to light, and it is apparent that vitamins are playing an increasingly important role in poultry feeding.

What Do Apples Cost?

Condensed from Capper's Farmer

M. N. Beeler

A GOOD apple year is disastrous to orchardists. There are enough trees of bearing age to produce a price-depressing crop any season when conditions are favorable. Such conditions have obtained with discouraging regularity the last decade. Any profits accruing from occasional light crops which sold at attractive prices were offset by losses in the bountiful seasons.

John A. Gage and Fred Hawkins, Jefferson county, Illinois, know what it takes to put a bushel of apples on the market. Detailed, accurate records have been kept in co-operation with the University of Illinois since 1923. The average up to and including 1936 was 70 cents a bushel. That included land value, trees, development of the orchard, labor, spraying, washing, packaging and similar items.

"Our records indicate that apple production was profitable, except for occasional years, up to 1932," said Mr. Hawkins, "and again in 1935 and 1938, when crops were light. But the average returns during 10 years have been discouraging."

Altho speaking from personal experience, he just about summarized the situation in that community and elsewhere. Some of the Gage and Hawkins orchard represents 45 years of labor and capital expenditure. Much of it is young trees just coming into mature production, ready to reward the effort put forth in development. But Gage and Hawkins are forced to consider means of adjusting a costly productive plant to the tempo of the times.

What can be done by an orchardist faced by a similar situation? He can't continue to produce apples at a loss. It would be unwise to stake too much upon a hoped-for rise in price levels. His plant is a living, growing thing that must be perennially protected and maintained. It can't be locked up until times improve.

Here's the Gage and Hawkins decision: Knowing costs, resulting from years of accounting and record keeping, their only chance to beat low prices was to prune those costs.

"Since our records were summarized, in 1936, our effort has been in that direction," Mr. Hawkins explained. "We started by removing nonprofitable varieties, such as Ben Davis, Ingram,

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Champion, Senator, Chenago, Minkler, Limber Twig and Red Delicious. Many of these were planted by Mr. Gage, in variety tests for the benefit of his nursery customers. Some are standard and satisfactory in other regions, but there are undoubtedly varieties in those regions which are similarly unprofitable. An example is Red Delicious which was planted quite generally because of its popularity among customers. In our experience it becomes a shy bearer about the time it should come into abundant production.

Then, irrespective of variety, there are certain trees which are not profitable. We have kept individual production records. Regardless of past performance, a tree goes out of our plantation after 5 years of unsatisfactory performance.

"Our next effort was to reduce spraying expense. Codling moth is, of course, the big insect enemy, the one which lowers fruit quality and the one which imposes the extra expense of removing poisons applied in the hope of controlling it. We have adopted a policy of determining, on our own place, when control measures will be most effective."

To do this Gage and Hawkins apply untreated bands to trees to trap larvae which seek shelter under them. These are collected in lots of 1,000 and placed in cages for wintering. Their emergence under observation determines the right time to spray.

"By this means we now get better control of the moth with 4 applications than we formerly got with 12," Mr. Hawkins continued. "In fact, thoro spraying and timely spraying, which coincide with emergence as indicated by the cages, has rendered the codling moth only a minor factor as affecting fruit quality from our orchard.

"Another advantage of fewer sprays is that we are able to avoid considerable expense in removing residues. We have less difficulty with both arsenic and lead to the extent that brushing instead of washing will put our winter varieties within the tolerance of state and federal regulations."

Thus a double saving, first in spray applications and then in removal of residues, accrues from use of the moth cages. Also, better control of the insect insures higher quality which commands a more attractive price.

After the first codling moth brood has developed, they go thru the orchard and thin to a set and spacing which experience and probable growing conditions indicate will result in a high proportion of first-grade apples. Of course, all punctured, deformed and underdeveloped fruits are removed.

Succeeding broods of moth descend from the first so that every

punctured apple destroyed reduces future infestations. Thus thinning saves spray material and makes later applications more effective. Further, in any normal year a tree will set more fruit than it can mature to quality size. Removal of the excess directs the whole strength of the tree into the apples that remain. The result is bigger apples, higher quality and better prices. That is especially true should dry weather become a limiting factor.

"We can do the thinning for 25 per cent of the cost of making the customary sprays under the old program," said Mr. Hawkins. "But, irrespective of codling moth control, money spent in thinning pays mighty good returns. For instance, our records show that thinning reduced yield by 50 per cent but increased size of fruit by 90 per cent. From unthinned trees 226 apples were required to make a bushel. The count on thinned trees was 158. These larger apples sold readily at a profitable price—even on the basis of our 1923-1936 cost average." The smaller apples from unthinned trees were still on hand in mid-October.

Big apples and high quality never become a problem. Small apples rarely, if ever, sell above the cost of production. The 226-a-bushel apples produced in the Gage and Hawkins orchard that year were definitely surplus. And the existence of such grades throughout the country was unquestionably a depressing factor in sale of bigger fruit. Removal of half the set would have eliminated them as a market problem.

Pruning in the older blocks has been used as a means of reducing spray expense, stimulating production and improving quality. The operation involves removal of large scaffold limbs, which opens the interior of the tree to penetration of spray and to sunlight.

"Taking out the excess wood has reduced spray expense by 30 per cent for individual trees," said Mr. Hawkins. "That, of course, is in addition to general savings effected in the moth cage method of determining timeliness. At the same time the severe pruning stimulates the tree to new growth and such growth invariably produces better apples. At the same time, apples borne on interior branches, near the trunk and larger limbs, get more sunlight and color better. That adds up to higher quality. The consumer will pay for size and color.

"We've been applying commercial fertilizers in the hope that they will improve size of fruit. Theoretically, a well-nourished tree should grow bigger apples, but to date we have no positive proof that applications have been effective."

A Swine Improvement Program That Is Getting Results!

Condensed from The Duroc News

P. J. Holand

Example No. 1 of Minnesota's progressive hog raising communities is Mower County with its Swine Improvement Association, supervised by Pete Holand of Austin. Mr. Holand is employed by the agricultural department of the Austin Public Schools to spend his time in educational work among adult farmers. As the farmers in this area have made most of their income from hogs, they chose to specialize in swine improvement and selected the record of performance as the way to this improvement.

After three years of experience, Pete Holand's efforts have brought excellent results, not only in improvement of hog raising methods in the community but in general promotion of pork and pork products. The following is a talk given by Mr. Holand at the Duroc Association's annual meeting in Chicago. It outlines a swine improvement and swine promotion program that many other hog-raising communities can well afford to seriously consider.

ANYONE who has any relationship with the swine industry is much concerned at present as to whether the swine raisers or America are on the right road in the economical production of quality pork on the farm; also as to whether hog production is adjusting itself to the present day demands of the American housewife. The Austin Area Swine Improvement Association is an organization that works with all breeds and crossbreeds of swine and 101 swine raisers in the Austin Area participated in the program this past season.

Our method of swine improvement is quite different from what heretofore has been the commonly accepted practice. We aim to produce a better hog by keeping detailed records of the individual sows in every herd. This means the earmarking of litters at birth or shortly after, weighing them at 56 days and perhaps again at 160 days, and from these records selecting the breeding stock from litters that prove to be the fastest and most economical growers. After having made these selections, the carcass cut-out of the littermates must be checked, for it is not enough to have litter

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identifications and litterweights. This method includes the rejection of these fast-growing hogs if they do not show a high yield of major cuts on the cutting floor of the packing plant.

During the past 3 years two general methods have been in operation in an endeavor to reach this objective. The first and foremost has been the enrollment of as large a number of swine raisers as can be taken care of in the "record of performance" association. In 1938 there were 53 members enrolled, in 1939, 82 members and in 1940, 101 members. The second method, unaccountable as far as records and weights are concerned, is a general arousing of all swine men in this area to the need of better feeding, sanitation and the positive necessity of a record of performance of individual sows in the betterment of their swine herds. Out of the second method of operation has come a number of activities that have attracted scores of hogmen from near and far. In 1938 a Swine Improvement Council was organized for the purpose of aiding in an advisory capacity. The council is composed of eight swine raisers of which six are purebred breeders and two are commercial swine raisers. Annual activities that have emanated from this program are evening schools in communities tributary to Austin in December, January, and February. These schools are held in four centers and meet weekly. Other activities are a swine tour and festival, the latter part of June, that visits 10 farms yearly and studies growth impulse of litters, pasture feeding of swine and management; a swine school of the air over radio station KATE of Albert Lea and Austin, held weekly; sow selection demonstrations held the latter part of July; record of performance swine show held in the forepart of August; swine clinics held in September; tested boar sale held in October and the annual swine Institute and Corn Show held the second Tuesday of each December. Two efficiency production trophies are awarded each year. One trophy to the purebred herd producing the most pounds of pork at 160 days from a five sow herd or better and the other trophy to the commercial swine raiser that produces the most pounds of pork from at least a seven-sow herd at 160 days.

One other activity of great importance to swine raising is known as Lard Education Days. The third annual lard week will be held in April of 1941. It is a community enterprise participated in by civic and agricultural organizations and swine raisers of 18 communities tributary to Austin. The two campaigns already held brought out the merits of lard as a shortening. The campaign in the spring of 1939 increased the sale of lard over the

year of 1938 by 22.5 percent in Austin and 18 surrounding towns. An increase in the sale of lard of 47.5 percent in 1940 to date, over 1939 has come about because of the lard educational campaign held this past spring. As producers of lard we are obligated to help sell the housewife on this superior shortening.

Now as to the record of improvement, or sow testing if you choose to call it, which is the "gold in the nugget." Twelve of the 53 swine raisers that participated in 1938 were purebred men; 18 of the 82 swine raisers in 1939 were purebred breeders, whereas, 25 of the 101 in 1940 were purebred breeders. I had to do most of the work on the farms the first year and still supervise very closely the purebred herds. Practically all of the commercial herds have been interested in carrying on this work with very little supervision the past two years.

Our swine raisers are taking advantage of this swine improvement program to build up their herds, with additional opportunity for purebred breeders to offer for sale tested breeding stock. Of the herds that have been carrying on sow testing for the 2 or 3 year period 75 percent show improvement, 10 percent show no improvement, and 18 per cent have been unable to produce better 56 and 160-day weights. The reason for the 18 per cent reverses is attributed more to lack of good management practices than to any other phase of pork production. To have litters in the registered purebred list for the area in 1941 the litters must weigh 265 pounds or better at 56 days. The requirements in 1940 were 260 pounds, in 1939, 255 pounds, and in 1938, 250 pounds. To offer tested stock at the tested purebred sale held annually in October, the boars and gilts are selected from this registered list.

56-day Weights Significant

From numerous tests that we have made of the correlation of 56-day weights and 160-day weights in 45 herds, we have found that 75 per cent of the pigs that were heaviest at 56 days were also heaviest at 160 days. This definitely established the 56-day weights as a very close check on the milking ability of the sow and a practical index of the time required for the pigs to reach market weight. In 99 per cent of all cases the fastest and most economical gaining hogs are of such a type that they satisfy the packer. In very few cases have the heavy litters been of such a type that they were not desirable market hogs. This work bears out the fact that there is a close correlation between growth impulse, desirable carcasses and economical production.

Now as to some figures we have obtained which will give you an idea of the scope of the work. In 1938: 2,544 hogs were in the

association; 4,706 in 1939, 6,901 in 1940. The average weight at 56 days of the pigs in 1938 was 30.07 pounds; in 1939, 30.1 pounds, and in 1940, 31.9 pounds. The average weight of the litters at 56 days in 1938 was 240.6 pounds; in 1939, 244 pounds; and in 1940, 255 pounds. In 1938 the litters represented per farm were 7, in 1939, 8 litters and in 1940, the season just closing, 8.5 litters. Over one-third of the members actively co-operating have feed costs of 4c per pound or $4.00 per hundred pounds gained.

In both 1938 and 1939 the heaviest litters for the year were the products of a cross. The best record was in 1939 when 9.9 hogs per sow were marketed, having averaged 43.7 pounds at 56 days of age with an average litter-weight at this time of 433 pounds. The carcasses carried a high percentage of the valuable cuts.

These results are not alarming to our purebred men for they have a good demand for boars out of litters that are recorded on the registry list of the area. At the annual tested-boar sale, boars out of the highest producing purebred litters for the past 2 years have been purchased by commercial men practicing cross-breeding. Our purebred men realize that a choice market is being saved for them if they can produce pure lines of high producing stock either for crossbreeding, straight commercial or purebred herds.

It is apparent that this business of swine improvement is a matter of hog sense, science, and mathematics. We are on a promising track and our hog producers are getting something with which to judge the heredity of their herds other than the colored ribbons of the show ring. The show-ring has its place but we believe it needs to be re-enforced by something of the nature of which we are judging our hogs at present in the Austin area. Fat barrows are scored as to growth rate, litterweight and carcass cut-out. The weight classifications that they compete in are 160-180 pounds, 180-200 pounds, and 200-220 pounds. This method represents as an unbiased method of judging swine from the producer-profit angle. The sow's pig-raising ability is judged, the growth rate is judged and so is the carcass. This may appear to be a hard method of raising hogs, but it is not. It is not difficult to keep these simple, interesting records for use as a greater aid to swine husbandry. Best of all, our swine raisers are now having success in establishing the kind of heredity that they want in their herds.

Packaged Fish Bait by the Ton

Condensed from Nation's Business

Glenn F. Jenkins

WHEN George Day was a barefoot boy he had a boy's natural curiosity about frogs, bugs and crawly things. Any other youngster would have outgrown them; but not George. He started to cash in. Now the Day Bait Company, of Port Huron, Mich., is advertised as "the world's largest packers of natural bait."

The Day Bait Company puts out more than 1,000,000 packages of frogs, worms, crickets, grasshoppers, minnows, crawdads (crayfish) and salmon eggs every packing season. Even Australia and South Africa take Day products.

Day buys bugs and things by the carload. Grasshoppers come from the western plains states, and they bring $500 a ton to the farmers and college boys who "harvest" them.

County agents in pest areas spread the news when bugs are wanted. Husky young men, used to working with their hands as well as their heads, rig "hopper dozers" on the front of their flivvers and push them into a stubble field. The forward boom agitates the grasshoppers and they start jumping into the air, many of them leaping into the gaping maw. Once in they are trapped, and can't get out.

Up and down the field for a turn and the "hopper dozer" is full. They are taken out and put into slack barrels, alive. They must be packed alive. Poisoned pests are nix. The same operations, with varying demonstrations of ingenuity, take place in harvesting crickets. Mostly, these come from Colorado, and they bring as high as $600 a ton.

And worms! You'd be surprised. The Day Bait Company supplies a liquid, which, poured over the ground, causes angle worms to "come up for air." They cover the ground and are easily gathered into pails, tubs and barrels. A warm spring rain brings the worms out in like fashion, and there have been times when they were so thick on the ground around Port Huron that the whole town of boys joined the harvest. On one occasion more than $500 was paid out for the crop.

All bait may be wet packed, though in some cases dry packing is preferred. Grasshoppers, crickets and crayfish are first put through a secret dry-curing pro-

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cess which preserves them in their original flexible and natural state. These may be either packed wet in bottles (some fisherman prefer them that way) or they may be packed dry in pocket-size cartons with cellophane covers.

Besides natural bait, Day manufactures several items in pigskin lures. These are die-cut in various shapes. Three tons of pigskins a month are used during eight months of the year. Pork rind with a half inch or more of underlying fat is used extensively in cutting frog shapes. The rind side is then dyed green, the belly side left white, and girls with deft hands paint in eyes.

Girls are employed exclusively in stuffing the worms, frogs and things into bottles. There isn't a piece of bottling equipment about the place. The only mechanical devices used are the simple hand presses used to cut out the hog rind lures. The company, which is an unincorporated family affair, will gross approximately $100,000 a year.

Save That Farm Manure

Condensed from The Michigan Farmer

Paul J. Rood

"MANURE is the by-product of the stable, the feeding yard and the strawstack." The soil fertility which manure contains came from the bedding and the feed consumed by livestock and in turn, the feed crops secured this fertility from the soil on which they grew plus nitrogen from the air in the case of legumes. Farm manures, then, contain fertility taken from the soils on the farm where the feeds were grown and it is important that as much of this fertility as is possible be restored to the soils on this same farm. The value of manure depends entirely on how it is used. If manure is regarded with indifference and neglect, it has little value. (One Michigan farm pile is known which represents the accumulation of 48 years.) If manure is regarded as a source of wealth from which supply, with practical and consistent management, we can restore to depleted soils necessary elements of lost plant foods, then manure so regarded and so managed has an exceedingly high value.

Freshly voided animal excrement consists of over 80 per cent water. This makes the plant foods considerably diluted and at the same time contributes to rapid loss since the plant food materials are largely in solution when voided. This shows the necessity

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of prompt, consistent care and the value of cement floors to prevent leaching and run-off losses and much absorptive bedding is required for sanitation and cleanliness. Of the 800 pounds of water in each 1,000 pounds of freshly voided animal excrement, about half will be lost through free drainage unless it is absorbed in bedding. The amount of bedding required to absorb and save this free liquid will be a little more than the amount of hay normally fed, from 10 to 12 pounds per day. Chopped straw, fodder, sawdust and shavings absorb about 3 times as much liquid as will be absorbed by uncut straw while muck and peat moss will absorb and retain considerably more.

Manure is rich in exactly the same plant foods which soils need most—nitrogen, phosphorous and potash. These are the same plant foods which we buy in the form of commercial fertilizers. If we fail to save these plant foods in farm manures, and fail to handle manure properly, then the problem of restoring to our soils adequate supplies of plant foods, and keeping these soils strong and productive, becomes more acute.

To save and effectively use the plant foods in farm manures will reduce the amount of commercial fertilizer we will need to buy in supplying to our soils the nutrients essential to best, and most profitable crop yields.

Manure is receiving very good care indeed when it accumulates in a covered feeding pen with a cement floor and sidewalls. The trampling of the animals packs the manure thoroughly and the saturation with liquids very effectively excludes air. Without air there can be little if any heating and loss due to injurious bacterial decomposition. This manure is effectively preserved just as is ensilage in the silo where air is not present and conditions of saturation exist.

Another good way to handle manure is to haul it from stable to field as quickly as is practical under existing conditions. There is some loss from manure spread on fields but the loss is decidedly less than would take place where manure is stored in a pile at the barn or where it accumulates in an open exposed feed lot. In many barns it is convenient to drive through the stables and load the spreader each day and go directly to the field for spreading.

Although manure contains sulphur, calcium, magnesium, iron and many other minerals, it's value is usually measured by the amounts of nitrogen, phosphoric acid and potash it contains. The amounts of manure produced by each 1,000 pounds of live weight for the various classes of animals will vary considerably, but the value is about the same. The approximate value of the nitrogen,

phosphoric acid and potash in the manure produced during 5 winter months in Michigan can be determined by multiplying each 1,000 pounds of farm livestock weight by $7.70.

The value of the nitrogen, phosphoric acid and potash per ton of freshly voided animal excrement for the various classes of livestock are approximately as follows:

Horse manure, $1.90 per ton; cow manure, $1.40 per ton; pig manure, $1,23 per ton; sheep manure, $2.88 per ton; hen manure, $3.85 per ton.

If possible every acre should receive manure once in 4 years. 800 pounds per acre of a 10-5-10 commercial fertilizer would carry about the same amounts of nitrogen, phosphoric acid and potash as is furnished by 8 tons of manure. The following is a good rule to follow in spreading manure: "Spread manure just as thick as you possibly can, provided, every field is covered once in 4 years."

Manure is out of balance as a fertilizer as it is very low in phosphoric acid. Average manure under common care would be represented by an analysis of about ½-¼-½ (½ per cent = 10 pounds nitrogen; ¼ per cent = 5 pounds phosphoric acid; ½ per cent = 10 pounds potash per ton total, with about 5 pounds nitrogen, 1 pound phosphoric acid, 5 pounds potash available the first year).

This phosphate weakness is one of the important reasons for reinforcing manure with superphosphate. One pound per cow or horse each day is about the equivalent of 40 pounds per ton of manure. The 20 per cent superphosphate should be sprinkled behind the animals in the manure gutter each day and on the dropping boards in the poultry house—1 pound daily for each 100 hens. At 8 loads manure per acre, this phosphate reinforcement would supply the equivalent of 320 pounds of 20 per cent superphosphate per acre. Another important function of phosphate applied to manure is to save the nitrogen, which is lost as ammonia gas most rapidly soon after manure is voided. The phosphate combines with this ammonia and makes ammonium phosphate, preventing extensive loss and effectively saving the nitrogen.

A test which started in 1897 has run now for 37 years and shows that reinforcing each ton of cow manure with 32 pounds of 20 per cent superphosphate in the stable greatly increased the average yields per acre per year when compared with yields where the stable manure was not reinforced. The manure was applied 8 tons per acre once in 3 years. The 256 pounds of 20 per cent superphosphate reinforcement would cost today $2.90 per acre and increased the average per acre yield of corn, each year 9.4 bushels, wheat 6 bushels, and clo-

ver 843 pounds. Even at today's crop prices each dollar spent for phosphate reinforcement should return about $4.50 in increased yields of corn, wheat and clover. Prompt hauling and spreading direct from stable to field in this same test gave increased yields of corn, wheat and clover which, at today's prices, would make each load of manure worth 59 cents more than it would be worth if left in a pile by the barn 3 months before hauling and spreading.

The value of farm manure produced during 5 winter months would, on the average Michigan farm, buy as much commercial fertilizer as half the total weight of the farm livestock. With manure accumulating beside the barn and in the feed lot through all the winter feeding season until spring, approximately half of this manure value is unnecessarily lost. The amount of this loss would pay very nearly half of the year's taxes on the average farm.

No longer can farmers regard manure fertility values with indifference and neglect.

It Can Be Done

Condensed from Sheep Breeder

J. F. Walker

YESTERDAY, a prominent wool man told me about a clip of wool he had sold this year. It was a large clip produced in a section where clips running into carload lots are common.

It was also produced in a section where shrinkages of 65 to 68% are accepted as normal for fine wools and 50% of staple wool is considered a fair average.

This particular clip went 100 per cent staple wool, averaged over 14 pounds in weight, had a shrink from two to three per cent less than the average and sold at a premium of from two to eight cents on the average prices for wools of similar fineness.

Said the wool merchant, "There is the result of years of line breeding and intensive culling. Every ewe that fails to measure up to the standard set is cut out of the flock. Rams must show a record of performance that justifies their use or they and their progeny go. The result is the best clip in the Southwest."

Reprinted by permission from the Sheep Breeder, Dec., 1940, Chicago, Illinois

Then I remembered a flock over on the Pacific Coast where a similar situation existed. A flock producing beautiful fleeces of white wool, long in staple, fine in quality, light in shrink and heavy in weight. This man had a similar formula for producing good wool, line breeding and heavy culling and today both flocks have a national reputation for the production of extra good wool clips.

In answer to an inquiry as to where they secured their rams, the answer was that they were obliged to breed their own as they could find nothing outside their own flocks that would deliver the goods.

At the Ohio State Fair a lamb buyer was telling me of a flock in his state that was producing a great crop of market lambs each year. Here the method followed was somewhat different as this particular sheepman purchased his ewes and rams and was dependent on others breeding for his operations. He was very particular in his selections, however. Only ewes of the best quality were purchased and rams of a certain type and breed selected to mate them with. It is nothing unusual for this man to pay $100 for a ram to produce market lambs. Many pure bred flock owners balk at this figure, but his returns justified the outlay.

One more illustration. In another state a flock was selected that in years past had been bred rather promiscuously. It was almost pure mutton bred but fleece weights were light, running around 4 to 5 pounds. This flock was rather an outstanding one in the district and for many years close attention had been given to its management.

A definite plan of fleece improvement was inaugurated and inside of a very few years weights had been increased 30 to 40% and with a better staple and wool of higher value.

The lamb crop not only reflected the increased yield of wool but was uniformly as good or better in mutton qualities as had been the earlier crops produced prior to the starting on fleece improvements.

Contrast this with a statement made by a large wool buyer in the Southwest who said, "As a rule the buck breeders in my territory have sure made a mess of their job. I could count on the fingers of one hand the men who are really producing high class bucks and I know of a hundred that are messing around at the game."

If a wool producer in New Mexico or California can produce a clip that is worth five cents a pound or more than other clips in his locality, or a lamb raiser in Kentucky or West Virginia can show equal results in improved quality of their lambs

or fleeces, then it can be done elsewhere.

A noted painter was asked what he mixed his paints with to produce the results he got. His answer was "With brains." Brains are a very essential element in breeding sheep for either mutton or wool.

Fortunately it does not require an abundance of this gray matter but it does require a rather intensive use of it. There is the rub. We refuse to accept the responsibility and are like the farmer who was urged to attend an agricultural meeting in order to learn how to farm better. His answer was "I already know how to farm twice as well as I am doing."

One may excuse the man running a commercial flock for his mental laziness in flock improvement provided the sheep are only incident to his general farming operations. No such excuse rings true to the one whose major investment is in sheep or who is handling a pure bred flock.

It is to the pure bred flocks that men must look for any improvement in the breed or the standards of quality of the industry.

As a pure bred flock owner, can you honestly say that you are making a contribution to your own breed or the commercial sheep man? If you cannot why not consider what the men whose efforts have been used as an illustration have been able to accomplish. Why not cull every ewe not producing a certain standard? Why use a ram whose offspring marks you as standing still or going backwards? You can make of your flock one of the great ones of the breed if enough time and thought is devoted to it.

The proof has been cited. It can be done.

Half a Million Heifers

Condensed from American Agriculturist

EVERY year northeastern dairymen discard about a half a million cows and raise or buy an equal number as replacements for the dairy. Because the average productive life of a dairy cow in this area is around five or six years, well toward 20 per cent of the herd must be replaced, and to do this, close to half the heifer calves born must be raised or cows must be purchased from other areas.

The first question of any dairyman to decide is this — "Will I raise my replacements or will I buy them?" There are unquestioned advantages in raising one's own. Such a program allows the development of a real breeding program. It is much simpler to control disease, and the calves can be grown the way the dairyman wants them. Too many heifers are not fed adequately, and as a result they come to producing age without the size and vigor to take full advantage of their inherited capacity to produce milk.

In New York State in recent years fewer cows have been brought in from other areas, and sales to other states, largely New England and New Jersey, just about balance cows purchased in Canada and dairy states in the Central-West. In the Northeast there is a considerable traffic of cows between areas. In general, sections close to markets raise fewer calves and buy more cows than regions on the outer fringe of an area supplying a particular market. While many dairymen in southeastern New York, New England and New Jersey raise no calves but buy all of their replacements, surplus stock is a source of income in other areas.

Health and Production

A good producing dairy cow, with rare exceptions, costs more than can be secured for an old dairy cow sold for beef. Furthermore, the man who buys cows is confronted with two difficulties—buying animals with the ability to maintain or improve the average production of the herd and buying animals that are healthy. The rather steady increase in Dairy Herd Improvement Associations has increased the number of cows with production records; but, while the total figures on cows in Dairy Herd Improvement Associations are rather impressive, cows with records still constitute a relatively small per cent of the total.

Since northeastern states have

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become modified accredited as practically free from bovine tuberculosis, that disease has ceased to be much of a problem; but contagious abortion and mastitis are still with us. Unless a dairyman knows whether or not contagious abortion is present in his herd, buying cattle is a gamble. If his herd is free of abortion, the introduction of cows with the disease may result in a storm of abortion in his herd. On the other hand, if his herd is badly affected, the addition of cows free from abortion is almost certain to result in their infection. With this disease, cattle that have been healthy are unusually susceptible to infection.

Mastitis is equally troublesome, but entirely different in the way it spreads. The infection is present in a large percentage of herds, ready to flare up when conditions are favorable; but the purchase of a cow badly affected with mastitis is something every dairyman wants to avoid.

Production Records Help

In general, dairymen buy cows in three ways. They purchase direct from dairymen, either locally or at some distance; they buy from men who deal in cows as a business; or they buy at auctions. Each method has its own problems and its own advantages. The man who believes that he can go into a herd on which production records have not been kept and pick out the best cows is overoptimistic. Based on experience, dairymen who do have records are often willing to allow a buyer to come in and, without looking at the records, pick any cow he wants at a specified price. Certainly buying from a herd whose owner raises all of his replacements, and who at the same time follows a good disease-control program, is one of the best and surest ways to buy healthy cows.

Speaking frankly, a good many dairymen are skeptical of the satisfaction they can expect from buying dairy cows of cattle dealers. As might be expected, there are all kinds of dealers. Many do their best to represent the cows as they are and try to give satisfaction to buyers. Others are less scrupulous. Naturally a dealer handles what a dairyman has to sell—seldom the best cows in the herd.

Auctions are of two kinds—sales by farmers and consignment sales which, in general, are confined to purebreds. In some areas there are also the dealers who bring cows in from other states in carload lots and sell them at auction. In general, these purebred auction sales are well handled, and buyers are well satisfied.

The idea has been expressed that farmers should organize cooperative dairy cow auctions where men who want grade cow replacements could go with con-

fidence that the true conditions of the cow would be presented and where the deal would be made good if purchases turned out to be unsatisfactory.

There are in New York State a number of privately owned auctions with sales once or twice a week. Usually they sell all kinds of livestock and sometimes other things as well. Any person, by paying the required fee, can consign animals to this sale. In most cases the auction takes no responsibility for adjusting unsatisfactory purchases.

Here are some suggestions to think over:

1. If conditions do not prevent, why not adopt a policy of raising all replacements?

2. If you feel you must buy, purchase cows with production records or heifers where production records are available on dams, and where possible, on two or three generations back.

3. Know the health situation in your own herd and have the same information on cows you buy. It is difficult to detect mastitis in a dry cow, but a good veterinarian can do it and his fee is good insurance.

4. Demand that any guarantee concerning the cow be put in writing, and be certain that the seller has the financial responsibility to make his guarantee good.

5. Consider the purchase of more young heifers. They will not need replacing so soon and, therefore, will lessen that angle of the problem; and many dairymen feel that the chances of introducing disease are less than where older animals are bought.

Efficiency of Poultry Meat Production

Condensed from Southern Planter

TO the oft-asked question, "What poultry meat is the cheapest to raise?" the University of Maryland poultrymen have given an answer. Here are the facts and figures issued by the Maryland Poultry Department:

Pounds of Feed Required To Produce a Pound of Bird

Age and weight of bird	Pounds of feed for each pound of bird
Goose (6 pounds at 12 weeks)	3.0
Turkey (6 pounds at 12 weeks)	3.0
Duck (5 pounds at 12 weeks)	3.3
Barred Rock Broiler (3 pounds at 12 weeks)	3.5
Leghorn Broiler (2.5 pounds at 12 weeks)	4.0
Turkey (15 pounds at 28 weeks)	4.2
Roaster (6.7 pounds at 28 weeks)	5.6
Capon (7 pounds at 28 weeks)	5.6
Duck (7 pounds at 28 weeks)	6.0
Goose (14 pounds at 28 weeks)	6.0

In general, feed cost comprises somewhat more than one-half the cost of producing poultry meat. The efficiency with which feed is converted into meat varies widely among various kinds of poultry, among various breeds of the same kind, among strains of the same breed, and among various ages of the same strain.

In deciding which class of poultry meat should be produced, two factors are most important: first, the market; second, the amount of feed required per pound of meat produced. Obviously there is little point in raising six-pound, 12-week-old geese if no one will buy them at any age. What is not so well understood, however, is that roasters, and especially capons, must sell for considerably more per pound than broilers and fryers to be equally profitable, since each pound of roaster costs about as much feed as one and one-half pounds of broiler or fryer.

Still less is the fact appreciated that these same roasters and capons must sell for more per pound to be equally as profitable as turkeys. Turkey fryers, six pounds at 12 weeks, are more efficient in converting feed into flesh than chicken fryers. They are equally delicious; and it is entirely possible that with further expansion of turkey production into a year-round business, turkey fryers will compete successfully with chicken fryers.

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Strawberry Clover

Condensed from Soil Conservation

Wayne W. Austin

Assistant Chief, Regional Nursery Division, Northern Great Plains Region

STRAWBERRY clover (Trifolium fragiferum) is one of the more recent introductions in the Great Plains, and undoubtedly will play an important role in the reclamation of low wet areas where the water table is near the surface. It does well on wet soils which have a relatively high alkali content; however, it makes its maximum growth and produces higher yields of forage on wet soils having little or no alkali.

This new legume is a perennial, low-growing, creeping, pasture-type plant that spreads by sending out trailing stems which root at every joint. It strongly resembles white Dutch clover when not in bloom, although the flowers and heads bear no resemblance to white Dutch. The flowers are rather large and round, and vary in color from pink to white. The mature seed ball, or head, resembles a miniature balloon made up of many compartments. Each of these compartments contains a seed which breaks from the head when ripe and may be distributed by livestock, wind or water. The seed is smaller than that of red clover, but larger than white clover seed, and may vary in color from a reddish brown to a mottled yellow and brown. The seed heads of strawberry clover usually contain a high percentage of hard seed; for satisfactory stands from raw seed, it should be scarified before planting.

Because of its ability to withstand flooding for short periods, strawberry clover is especially adapted to low, wet areas. Its alkali tolerance makes it a valuable plant for use in pastures that are too salty for the more common grasses and legumes. This plant has the ability to establish itself in wet meadows having thick stands of saltgrass, alkaligrass, and alkali weed. In pastures where there is a heavy concentration of salt, strawberry clover will take over the low, wet areas, leaving the saltgrasses and alkali weed on the drier high spots. It has been known to survive salt concentrations up to 4 percent.

Carl A. Larson, working in Washington and Oregon with strawberry clover, found that, in pastures with high water table and with salt concentrations near the surface, the root systems of

Reprinted by permission from Soil Conservation, Aug., 1940, Washington, D. C.

the plants were restricted and close to the surface. On the better drained soils having a low salt concentration, strawberry clover plants were found to have a rather extensive root system, penetrating to a depth of 31 inches. He also found that flooding helps remove salt concentrations on the surface, and thus makes growing conditions more favorable for this clover.

Strawberry clover is not a dryland plant; it will not grow on high, dry ground. White clover and strawberry clover have very similar water requirements. Strawberry clover is able to withstand long periods of flooding and is more alkali-resistant than white clover.

Strawberry clover is not a native of this country. Dr. E. A. Hollowell states, "Strawberry clover is a native of the eastern Mediterranean and southern Asia Minor countries; however, it has been widely and inadvertently spread by man. It has been observed on every continent of the world; and wherever it is grown, the value of the pasture herbage has increased." It appears likely that strawberry clover found its way into this country by way of Australia, probably mixed with other plant seeds. Escaped plants were found in the eastern part of the United States over 50 years ago. Later, small areas of it were found on irrigation projects in several of the western States.

The Soil Conservation Service has had this clover under observation at the Lander, Wyo., nursery for several years. In 2 years' time, because of its stoloniferous growth habits, rows planted 36 inches apart closed in completely. Although strawberry clover seed is somewhat difficult to harvest, it is capable of producing a high yield of excellent quality seed. A 1-year-old stand of strawberry clover, planted in 36-inch rows for seed production, in the Soil Conservation Service nursery, at Mandan, N. Dak., produced almost 200 pounds of clean seed per acre under irrigation. When this stand gets into full production it should yield between 400-500 pounds of clean seed per acre.

Strawberry clover is highly palatable and very nutritious. All classes of livestock and poultry relish it and usually graze it so closely that seed production is limited. Larson found that strawberry clover grown on alkali-free land had a higher nitrogen and calcium content, but a lower phosphorous content than plants at the same stage of maturity grown on alkali-impregnated soils. Strawberry clover will stand up surprisingly well even when grazed continously from early spring to late fall. Too close grazing in the late fall however, may result in a high percentage of winter killing which will affect the carrying capacity the following year.

This new legume does best when planted in a grass mixture. A pure stand of this clover may cause bloat; but there is little danger of bloat when it is used in a mixed grass pasture.

Several fields of strawberry clover are scattered throughout the western part of Nebraska and the eastern part of Wyoming. One sizable pasture containing strawberry clover is located in Morrill County, Nebr., northwest of Northport, on the Bart Moore farm operated by Henry Nagel. The Bridgeport C. C. C. camp technicians became very much interested in this pasture and arrangements were made with the owner and the operator to use C. C. C. boys to collect some of the seed on a share basis; 110 pounds of clean seed were obtained and at the same time the camp agronomists collected some very interesting historical data concerning this field.

Mr. Nagel said that when he moved on to the farm in 1935, this pasture of 46 acres was covered with saltgrass and other wet meadow plants. The field was seepy, and during certain times of the year it became very boggy. On May 15, 1935, he turned 44 head of steers on the pasture; after 90 days of grazing it was necessary to supply supplementary feed, and at the end of 105 days the steers had to be moved because there was no feed left. In 1936, the pasture produced only enough for 44 head of steers for 60 days.

In the spring of 1937, Mr. Nagel secured a pound of scarified strawberry clover seed and planted it during May in small plots scattered over the pasture. Each plot was protected from grazing by means of cattle guards consisting of two posts with slats nailed across them. Several different methods of planting were tried. On one set of plots the sod was removed with a shovel and the ground was spaded and packed; the seed was surface-planted, raked in, and then packed again. On another set of plots, the sod was removed but the ground was not disturbed and the seed was surface-planted, raked in, and packed. The third method consisted of giving the area to be seeded a thorough raking without disturbing the sod, then surface-planting the seed, raking it in, and packing it well. In the fall when the cattle guards were removed, Mr. Nagel found clover plants on all the plots, but in every case very much better stands of clover were found on plots where the sod had not been disturbed but only worked up with a garden rake. When the cattle guards were removed from the plots the cattle were still in the pasture. Numerous seed balls were present, filled with ripe seed, and these were eaten by the cattle.

In the spring of 1938, two more

pounds of seed were planted and protected as in the previous year. The old plots were not covered, however, and the cattle were allowed to graze them at will. Then during the late summer of 1938 Mr. Nagel made an important discovery; he noticed that small clumps of clover plants could be found widely scattered over the pasture and, in almost every instance, these clumps of clover plants were on or adjacent to old droppings. The cattle had eaten the ripe seed balls the fall before and as the seed passed through the digestive tract of the animals the hard seed coats were softened and made permeable to water. When this excreted seed came in contact with the moist, well-manured earth an excellent stand of clover seedlings was soon started.

By the fall of 1939 the clover had spread over the entire pasture. It is still somewhat patchy, but this condition will not last long because the clover spreads by means of runners which enlarge each patch until the ground is rather thoroughly covered. By the end of 1942, this field should be one solid mat of clover and grass.

Mr. Nagel has been keeping accurate figures on the number of livestock this pasture is carrying and the amount of supplementary feed he has used each year along with it. The following table shows the benefit he has derived to date through the addition of strawberry clover to this 46-acre pasture:

Year	Number of animal units	Total number of days pastured	Animal days without supplements	Animal days with supplements	Total number of animal days	Total number of animal months
1935	44	90	3,960	660	4,620	154
1936	44	60	2,640	None	2,640	88
1937*	45	70	3,150	None	3,150	105
1938*	78	120	9,360	**	9,360	312
1939	78	107	8,346	2,574	10,920	364

*Strawberry clover seeded in small plots in May.
**Some feed left.

On May 3, 1939, 66 head of steers, 7 horses, 5 milk cows, and 3 calves were turned on this pasture. On August 17, the steers were given about one-fourth full fattening rations. On September 20, all livestock were removed from the pasture although considerable feed was left. The Soil Conservation Service C. C. C. camp then came in and collected 110 pounds of clean seed—and a considerable amount of seed remained after they had finished.

The steers, after being removed from the pasture, were put on

full feed. They were sold on December 4, 1939, after having made a gain of 501 pounds per steer, or an average gain of 2⅓ pounds per day per steer while they were in Mr. Nagel's possession. Although no scales were available on the farm to check the exact weight, it was believed that at least half the gain was made while on pasture. If a 250-pound gain is assumed from the pasture, the profits per acre undoubtedly were greater than for any other field on the farm.

These gains speak well for Mr. Nagel's ability as a livestock feeder. He is very modest about his ability, but he is eloquent in his praise of strawberry clover. He reports that it is not "washy" as so many legume feeds are, and that his livestock has not suffered from bloat although no precautions were taken to avoid it.

It appears that strawberry clover is unsurpasesd for wet boggy pastures. It also seems to offer considerable promise for irrigated pasture mixtures. It would be well to watch this plant closely and even try some small patches in a low-lying pasture in order to find out what it will do. Certainly this clover shows promise of filling a long-felt need for a wet pasture legume in the irrigated section of the Great Plains and, by utilizing these wet areas for pasturage, a better system of farming is possible for the entire farm.

Partnership Plans for Cattle Feeding

Condensed from Pacific Rural Press

WHEN one man furnishes the steers and the other has the land and feeds them, how should the profits be divided?

The PRP was asked that question by one of its subscribers in Hawaii, and took the question to Prof. R. L. Adams, of the University of California, who is a practicing farmer, as well as the outstanding authority on farm management problems.

Professor Adams and his associate, William H. Smith, Jr., supply the answer to the question out of practice and performance in California and we pass it along for the information of all interested farmers.

The various plans for doing this are based on the general premise that each is entitled to a share in proportion to his contribution to the deal.

The most exact way to do this is set down as follows:

B FURNISHES		**A FURNISHES**	
Investment:		**Investment:**	
feeder steers, 300 head, 600 pounds each, at 6 cents per pound on the range	$10,800.00	pasture land, 3,000 acres at $20	$60,000.00
		fence, 87,520 rods at 40 cents	35,008.00
		pumping plants, 2 at $2,500	5,000.00
B PAYS		**A PAYS**	
Interest on investment at 4 per cent:		**Interest on investment at 4 per cent:**	
livestock	$ 432.00	land	$ 2,400.00
		fences	700.16
		pumping plants	100.00
Mortality:		**Depreciation and upkeep:**	
300 head, 3 per cent of $10,800	324.00	fences, 87,520 rods at 3 cents	2,625.60
		pumping plants	275.00
Other expense:		**Other expense:**	
delivery expense to pasture	19.50	salt and other minerals at 6 cents per head	18.00
pro rata of gathering and shipping cattle (75 per cent)	225.00	electricity for pumping	85.00
taxes on stock	108.00	taxes on land	600.00
	$ 1,108.50	pro rata of gathering and shipping cattle (25 per cent)	75.00
value of stock when placed on range	10,800.00	accounting for or supervision of cattle after sale at 25 cents per head	75.00
B pays and contributes	$11,908.50	A pays and contributes	$ 6,953.76

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"The tabulated items," Professor Adams explains, will require some agreement as to values of land, stock, fences, etc., and will require agreement on probable expenditures for various items in advance. For example, suppose the fences to be 3 strand barbed wire costing 40 cents per rod set up, and that these fences depreciate at the rate of 5 per cent per year (that is, 2 cents per rod). The yearly upkeep is estimated at 1 cent per rod. If the 3,000 acres be in a square about 87,520 rods of boundary fence will be needed. The depreciation and yearly upkeep for these fences would then be 87,520 x .03 or $2,625.60. Interest at 4 per cent on the average investment in fences would be $700.16.

"Now let us estimate B's delivery expense for labor and horses (3 men and 3 horses). If labor be figured at $2.50 per day and horses at 75 cents per horse day, the total cost is $9.75 per day. Assuming that the stock can be moved in two days on foot and with no expenditures for feed and water en route, the total cost would be $19.50.

"Water costs are made up of electricity or fuel for pumping, depreciation and repairs on the pumping plant, and interest on the average capital represented by the pumping plant. Suppose two shallow wells are needed, the investment in each to be $2,500, depreciation being 5 per cent or $250 per year, repairs being $25 per year and electricity being $85 per year. Interest on average investment would be 4 per cent of $2,500 (one half of the original value of the investment).

"It will be necessary to consider mortality as an expense paid by B who should therefore be credited for any loss to mortality of stock. If we asume mortality at 3 per cent of the value at the time of placing on the range the loss would be $324.

"Salt is usually furnished by the owner of the land and at 6 cents per head this would come to $18 for the season. If the expense of gathering and shipping the cattle be estimated at $1.00 per head, then $75 will be A's share and $225 will be B's share of the expense.

"The total contribution will be $6,953.76 for A and $11,908.50 for B or $18,862.26 in all. A furnishes 37 per cent of the total and B furnishes 63 per cent of the total, hence each should share in the proceeds in that proportion."

Another plan, simpler but not so accurate, values the cattle as they go under the deal. Each party pays half of the costs of labor, salt, feed, repairs, shipping. Then each shares equally in the proceeds.

A third plan, simpler still, but even less accurate, weighs the cattle as they go on the land. The land owner furnishes the labor,

feed, etc., and is paid the market price for gains made by the cattle. For instance the cattle start at 600 pounds, gain 300 pounds, and sell for 8 cents per pound. The land owner gets 8 times 300 pounds, or $24.00 per animal. The cattle owner gets 8 times 600 pounds, or $48.00.

Improving Sudan Grass with Sweet Sorghum

Condensed from Texas Farming and Citriculture

R. E. Karper

SUDAN grass, first introduced into the United States and grown at the Texas Experiment Station at Chillicothe 30 years ago, has in the past three decades become the most important cultivated pasture and hay crop in the Southwest, and is of considerable importance as an annual pasture in many other parts of the country.

Romantic Story In Texas

The crop has had a romantic history in Texas since its introduction in 1909. The distribution of a few pounds of seed to five of the best farmers around the Lubbock Station in 1912 established the South Plains of Texas as the center of Sudan grass seed production in the United States; it has held that distinction up to the present time. This region was then being changed from ranches into farms, and was being brought under the plow for the first time. The soil was virgin and large yields of seed ranging from 1,000 to 1,500 pounds were not uncommon. There were no Johnson grass or obnoxious weeds, and a high quality of seed was soon available for wide distribution over the United States. Sudan grass seed sold for $3 a pound, later for $1 a pound, and finally settled down to 10 to 20 cents a pound.

A demand in more recent years for summer pastures has greatly expanded the outlet of seed. Texas and New Mexico alone produce 40 to 50 million pounds of Sudan seed a year, which is 75 to 80 percent of the nation's crop. The balance of the seed crop is grown in California, Colorado, Kansas, and Nebraska. This grass has been worth millions of dollars to the agriculture of Texas and the Southwest, and recent experiments promise to bring it into even wider usefulness. Improved varieties have been developed, and experiments have shown that some 4 to 6 months of grazing will produce gains ranging from a

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pound to two pounds per day—under favorable conditions a carrying capacity of one cow to the acre can be obtained.

Through recent discoveries by the plant breeders who have been working with sorghums at the Texas Experiment Station it has become possible, through well-planned experiments of crossing and back-crossing, to produce new synthetic varieties of Sudan grass having valuable economic characteristics not present in the old common variety. A variety of sweet sorghum, Leoti, is being used as one of the parents to cross with Sudan grass; the purpose is to transfer this sweet sorghum parent into the new Sudan grass strains such valuable characters as sweet stalk, juicy stalk, non-shattering seed habit, a distinctive glume color, and resistance to bacterial foliage diseases commonly called Red Spot.

The breeding procedure has consisted of crossing Leoti and Sudan grass, selecting plants in the second generation bearing the above mentioned characters, and making another cross back to the Sudan grass parent. The first cross results in 50 percent Sudan grass "blood," the second 75 percent, and so on until the new strains are, for all practical purposes, pure Sudan grass with the added new characters carried over from the sweet sorghum parent.

This breeding work was started only a few years ago, but through the use of field plantings in the summer and greenhouse crops in the winter, it has been possible to grow two generations a year and thus speed up the process. Several hundred selections resulting from four and five backcrosses to the Sudan grass parent are now being grown in comparative experimental trials in order to determine the best among them, so that they may soon be increased for seed distribution to farmers.

These new varieties of Sudan grass promise to greatly simplify the problem of the contamination of this seed with Johnson grass seed—a condition that in recent years has become a very vexing problem. It is a long and difficult task for seed analysts to make determinations on Sudan grass seed containing Johnson grass mixture, and they will enthusiastically welcome a simplification of this problem.

Glume Color Importance

The Leoti sorghum parent used in this plant breeding venture has an attractive sienna-colored glume which is inherited rather simply, since it is bound to recur on one plant out of sixteen grown in the second generation. The problem, then, is to select a plant that has a sweet and juicy stalk together with a non-shattering seed habit, and cross it back to ordinary Sudan grass, continuing this procedure as long as desirable to get the new strains.

Exit Johnson Grass

The Texas Station sorghum agronomists have recently shown that the danger from contamination with Johnson grass through hybridization is negligible, as the hereditary makeup of Johnson grass and sorghums are so different that they are not compatible and do not cross readily.

The chief hazard in the spread of Johnson grass, therefore, is through mechanical mixture with other seed, and with Sudan grass especially. Johnson grass mixture has in recent years become a very real problem, the solution of which will be very greatly aided when the improved sienna-glumed strains come into the market channels.

One of the reasons why Sudan grass proved to be a successful and satisfactory new crop introduction is because it had relatively good seed habits, making for a satisfactory and dependable seed production. It is a well known fact, however, that with the cool weather of autumn the seed crop ripens slowly, and has a tendency to shatter out of the head as it matures—almost as rapidly as the seed on the tillers reach maturity. In certain years Sudan grass never reaches a very satisfactory stage when it can be cut for seed, on account of the simultaneous ripening of the seed on some of the stems and the shattering from other stems that are slightly more mature. Station workers have found that shattering of the seed of sorghums is hereditary, and they have now transferred the non-shattering seed habit of Leoti into the new varieties of Sudan grass. This should result in a more dependable seed supply, larger seed yields and a wider adaptability and usage of the crop.

Disease Resistance Sought

In the more humid regions of the United States certain bacterial leaf and foliage diseases commonly attack Sudan grass, reducing both the yield and the quality of the forage and thereby reducing acreage planted to Sudan grass for pasture and hay. Leoti sorghum, with its distinctive glume and plant color appears to be more resistant to these foliage diseases than other sorghums. One of the objectives of the breeding program is the incorporation of disease resistance into the new Sudan grass strains. Nursery plantings of a number of these new strains at the College, at the Angleton Station, and at the Lower Rio Grande Valley Station, where these foliage diseases are more prevalent, have shown some of the strains to be superior to others and to Sudan grass in their ability to resist Red Spot. They are not immune, but they do possess a certain amount of resistance which should render them better adapted to the more humid regions of the southern and eastern part of the United States.

The Office of Forage Crops and Diseases of the United States Department of Agriculture has cooperated in trials of the new strains for their resistance to foliage diseases at various points in the eastern part of the United States. This phase of the breeding problem is by no means complete, but it is believed that a higher degree of resistance to Red Spot and to other foliage diseases, such as Helminthosporium, which is very prevalent and destructive in the South and East, can be attained.

Livestock Gains Great

It has been found that young Sudan grass in the growing state, when it is being pastured by livestock, for example, contains as much as 20 per cent protein, and gains of from one to two pounds a head per day can be obtained in cattle. Sudan grass is recognized as an excellent summer grazing crop; but judging from the "consumer preference" exhibited by cattle grazing on some of the new varieties with sweet and juicy stems, the improved strains are much more palatable than ordinary Sudan grass. In 1938 at the Chillicothe Station some 150 of the new selections were grown side by side with Sudan grass, and a small bunch of dairy cattle turned in for observation upon their grazing preferences. It was found that about 15 rows out of the 150 were selected by the cows and grazed down almost to the ground, while other selections and ordinary Sudan grass were hardly grazed at all. In a number of cases the preferred strains seemed to be those having sweet and juicy stems; however, this was not always the case, as some of the better-grazed rows were neither sweet nor juicy. Grazing trials with cattle at the Beeville Station showed similar results, and trials with hogs at the Main Station clearly indicated a distinct grazing preference for some of the new Sudan strains. This matter of the preference of animals for certain strains is so striking that much more work will be done on this phase of the study, in order to learn what characters in the crop are responsible for improved palatability.

The Progress of the Holstein-Friesian Breed

THE progress of the Holstein breed in this country is another step in the development and expansion of a breed originating in Holland more than 2,000 years ago. Roman conquerors of that great dairy land, recognizing the utility of these cattle, took many of them as tribute and thus, twenty centuries ago, aided in the spreading of this superior breed. From Holland the Holstein-Friesian breed—which is called Friesian or Friesland except in North America—spread over the world and increased in numbers as no other dairy breed has ever done. Holsteins have proved adaptable to all the variations in climate and food from the tropics to the cold countries of Newfoundland and Alaska. The Grenfell Mission on the bleak coast of Labrador has selected the Holstein-Friesian breed for its dairy herd, and in tropical South American countries Holsteins lead all other dairy breeds in popularity.

In the United States they are found in every state and are the most numerous breed in all of the leading dairy states. From a beginning of a few thousand imported cattle more than 2,900,000 have been registered, and the U. S. Department of Agriculture statistics show that the total Holstein population of the country is approximately 10,000,000. The present trend is rapidly upward, there having been a steady increase in number of registrations each year for the past five years, and during the first eight months of 1940 more registration certificates have been issued than during the entire year of 1939.

Holsteins hold world records for both milk and butterfat production for yearly records at all ages with one exception. The highest officially recognized lifetime record for milk production is held by a registered Michigan Holstein, Ionia Aaggie Sadie Vale, that has produced more than 230,000 pounds of milk, and is still producing heavily on her current lactation. The highest officially recognized 365-day record for both milk and butterfat for all breeds is held by Carnation Ormsby Butter King with a production of 38,606 pounds of milk and 1,402 pounds of butterfat. More than 308 Holsteins have completed yearly records of more than 1,000 pounds butterfat and many of them have two or more such records. There are several cases in which a daughter and her dam have each produced over 1,000 pounds butterfat.

The herd average of 615 pounds butterfat from 16,366 pounds milk testing 3.8 per cent made by a herd owned by Walter

Splinter, Winslow, Ill., is the highest official average ever made by a Holstein herd in this country on a twice-daily-milking schedule, and it is believed to be a world record. The highest herd average ever made by a Holstein herd irrespective of milking frequency is 665.5 pounds. The highest for a herd of more than 10 cows is 658 pounds made by the 13-cow herd of H. A. Dressler, Lebo, Kansas. The U. S. Department of Agriculture Farmer's Bulletin No. 1443 shows that the average of 56,007 Advanced Registry records, including 15,354 ten-months records, average 16,005 pounds milk and 546 pounds butterfat.

The number of registered Holsteins on official test for Herd Improvement Registry on October 1, 1940, was 14,707 from 457 herds. This is a gain of 696 cows within the past year. On October 10, 1940, 175 herds had 2,301 cows on test for Advanced Registry.

Holsteins are the largest of all dairy cattle, mature cows averaging 1,250 pounds and sometimes reaching the weight of 1,900 pounds. The large size and capacity of these cows makes possible the efficient use of home-grown roughage. U. S. Department of Agriculture studies prove that Holstein cows produce 79 per cent as much milk and butterfat when fed roughage and pasture as when fed these in combination with high-priced grains. This efficient use of home-grown roughage makes the Holstein-Friesian a great net-profit breed.

Shipping Horses

John A. Gorman

REDUCING LOSSES IN SHIPPING. A great deal of profit is lost in marketing horses because of injuries, sickness and loss of condition in shipping. Many of these losses may be prevented by proper care and feeding before and during shipping. In seven different localities in the East, South and Central West, 26,956 horses were shipped in from distances of 1000 miles or more. Of this number, 3,060 were injured and 266 were dead. After one auction sale in the range country a claim was turned in to the railroad on almost every car of horses shipped from the auction.

Safe shipping begins before the horses are loaded in the stock cars. Horses that have been on full feed should have their feed decreased. Hay rich in protein, as alfalfa and clover, should be gradually replaced by prairie or timothy hay, and the concentrates should be gradually eliminated. The horses should be fed and watered within a few hours of loading so they will not be too hungry and thirsty before they are unloaded for feed and water. All shoes should be removed from horses to prevent injury from kicking and stepping on each other.

Range horses that are driven or trucked to the stock yards should have a few hours to rest, feed and water. If they have been driven a long way they will be very hungry and thirsty. Often they are held in a corral or pasture with limited feed all night and are driven most of the next day before they get to the stock yards. This is as hard on them as a 36 hour ride in the stock cars. As they are generally shipped off of grass they are soft and lose a great deal of weight. If they are loaded without sufficient feed and water they will be very restless in the car and may injure each other. Their resistance may be lowered and they may be more susceptible to influenza or shipping fever and similar diseases associated with shipping. They should be loaded as cool as possible. If they are hot when loaded they will be more susceptible to colds caused by cooling off too rapidly.

In the Southern states there is a fly that lays eggs in any wound or scratch on an animal where there is blood. The eggs hatch in a few hours and the larvae, called screw-worms, eat the flesh. Horses that arrive during the summer or early fall months in a bruised condition are very sus-

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ceptible to screw-worm infection.

Preparing and Loading the Car

To prevent injuries in shipping, it is wise to make use of partitions. If a mixed load is shipped, mares with young foals will fare better if they are separated from the other horses. If mares and foals are shipped as a straight car, the foals generally stay close to their dams and will ship very well. Vicious horses should be partitioned off. If they are left loose they may bite, kick or run over the other horses especially if they are loaded with horses that are younger and smaller. Stallions should be partitioned off. Sometimes it is suggested that stallions be tied, however there is some risk involved. If stallions are tied, they should be tied with a halter and never with a neck rope. Young stallions of the range country are usually no more vicious than geldings and are often shipped in a mixed load. Old range stallions may cause injuries by running through the doors and chutes and jumping over the smaller horses in their efforts to escape. Mares heavy in foal should be separated from the others. On the whole, horses of equal ages and sizes do best when shipped together.

When range horses are loaded, it is advisable to place a few in a pen and run them into the car. Repeat the loading of small groups until the car is loaded. Prod poles should never be allowed when loading range horses, neither should excessive noise. Horses should be placed three or four cars back of the engine. In this position, the noise is not excessive and the jerks caused by taking up the slack in the train is not great.

The cars should be ordered from two to four days in advance so they can be inspected and put in condition for shipping. See that nails, broken boards, rough projections, and other things that may injure the horses are removed. Cars should be bedded with two or three inches of sand; dirt should never be used as it will get slippery when wet. Straw placed over sand makes a good bedding and prevents slipping. Shavings may be used in place of straw. In very cold weather it may be wise to paper one side of a stock car to prevent excessive drafts caused when slatted cars are pulled into a strong wind.

Cars should be loaded reasonably full so horses will not lie down and get tramped on. If the cars are loaded too loose the horses may injure each other by kicking. If they are over loaded they will bruise and step on each other. The Army loads about eighteen draft horses and twenty to twenty-two riding horses to a 36-foot car, and twenty draft and twenty-five riding horses to a 40-foot car. This number fills the car to its loaded capacity.

Rules Governing Shipping

When one decides to ship a carload of horses he should learn the rules governing brand and health inspection. He should learn how to order, inspect, and prepare cars for shipping. He should learn the rules regarding handling horses enroute. The United States Department of Agriculture publishes the "State Sanitary Requirements Governing the Admission of Livestock." This publication may be purchased from the Superintendent of Documents, Washington, D. C., for ten cents. From this book one may learn all the rules regarding shipping horses into various states. Or the health inspector may inform you as to the rules.

There are different rules regarding shipping horses into different states.

A brand inspection is necessary before horses are shipped out of a state and sometimes when horses are moved from one county to another within a state. The state brand inspector or sheriff's staff can inform one regarding brand inspection. A small fee is charged for the service.

The state veterinarian, or veterinarians authorized by him, may make the health inspection. The fee goes to the veterinarian making the inspection.

Horses may be shipped in regular stock cars, box cars, or horse cars. Commercial horses are generally shipped in stock cars. The freight rates are the same for stock cars and box cars of the same capacity. The standard stock cars are thirty-six feet and forty feet long and are slatted up the sides to allow ventilation. The minimum weight for a 36-foot car is 23,000 pounds, and 25,760 for a 40-foot car. The shipper must pay for 23,000 pounds although the carload of horses may weigh less. If there are over 23,000 pounds of horses the shipper must pay the extra freight. The charge for bedding with sand is $1.10. No further charge should be made for bedding while the horses are enroute. The stock yards charge a small fee for loading a car. However, if the horses are fed at the stock yards before they are shipped this fee is not collected as the stock yards make their profit on the feed.

Care of Horses Enroute

Horses are unloaded for feed and water every twenty-eight hours unless the shipper signs a release. A release gives the railroad permission to unload every thirty-six hours. Almost all shippers sign the thirty-six hour release. It may be better to have the horses go thirty-six hours without feed and water than to unload them at some place with poor feeding accomodations. The minimum hay allowance is 200 pounds per car. Most shippers feed 400 pounds of hay. The shipper gives instructions to the

agent as to how much feed should be fed enroute.

Some shippers place 200 pounds of hay in the car so the horses will be content enroute. However, the horses may get kicked on the head while they are picking up the hay. If range horses are driven to the stock pens and do not have a chance to feed before being loaded, the shipper may profit by having them unloaded for feed and water in less than twenty-eight hours. Prairie or timothy hay is best to feed prior to and during shipping. If grain is fed it should be fed in limited quantities. Some shippers want their horses fed before they are watered but they are usually watered before they are fed. In winter, ice water should be avoided. If ice water must be used allow the horses to drink a small amount at intervals.

A shipper is allowed to send a caretaker with each consignment of horses. Most railroads, especially those of the West, allow the caretaker a return fare on a passenger train over the road on which the shipment was made. If horses get down in the car he may have the car stopped and unloaded so he can get them to their feet. If horses are very tired he can delay the loading until they are ready to go. Most carloads of horses are shipped without a caretaker. The employees of the railroad see that the horses are properly cared for and delivered.

The man who receives the horses should make notes of any fresh injuries that were caused by shipping. These notes should be made in the company of a railroad representative. Each injury and death loss and the estimated damage should be itemized. Until the claim is settled a complete file of the correspondence should be kept by the person making the claim.

Less Than Carload Shipments

Horses may be shipped in smaller units than carloads, but the cost per horse will be greater. The number shipped will vary from one to three as the rate for a greater number will equal or exceed the carload rate. Stock cars and box cars are used. Stalls can be built in one end of a car by putting strong 2 inch by 6 inch planks across the car. The partitions should be built so the horses cannot get their legs over or between the planks. One or more horses that are accustomed to one another will ship well in such a stall.

Shipping by Express
Less Than Carload Lots

Valuable horses and ponies are occasionally sent by express in less than carload lots. Horses weighing less than 500 pounds shipped uncrated are shipped at one and one-half times the first-class express rate. Horses over 500 pounds and less than 1000 pounds are shipped at 1000 pounds minimum weight. They

are shipped at three times the first-class rate with a minimum charge of $34.65. The rates are being changed and the minimum charge may be changed.

Crated horses weighing over 750 pounds are shipped at the first-class express rate. Horses weighing over 750 pounds go at one and one-half first class rate. Horses sent by express are cared for by employees of the express companies.

Carloads by Express

Race horses and show horses are often shipped in express cars. The cars may be furnished by the express company or a stock car company that leases cars to the express company, railroad company, or to an individual.

Horse Insurance

There are companies which insure horses and other livestock. Most companies insure horses for loss by death but not for loss caused by sickness, injuries or the loss of their use. Ranch horses are seldom insured, but occasionally the more valuable horses are insured.

The livestock companies have made a survey of the mortality of different classes of horses and have based their rates on their findings. For this reason the rates are different on different classes of horses. The rates may be readjusted from time to time as their studies show changes in the mortality rate. Contracts are generally written for one year. After one year the animal must be inspected and a new contract issued. Short term insurance policies are issued for horses on the show circuit, for mares at foaling time and for horses during shipping.

The Hartford Accident and Indemnity Company insurance rates for different classes of horses are as follows:

	Per $100 Value
Farm horse; age 6 months to 12 years	$7.00
Mares in foal	8.00
Standard racing stock	5.50
Polo ponies	6.00
Draft stallions; age 2 years to 10 years	8.50

The rate for racing stock is for less than six head. If more than six head are registered, the rate is $5.00.

The foaling policy for mares begins on the day of foaling and lasts thirty days. This thirty-day policy costs $5.00. Horses shipped to market may be insured for 75 cents if the trip does not exceed 500 miles. For shipments in excess of 500 miles, the rate is $1.00. Colts under six months are not insured. The rate for collision while enroute is usually 40 cents for 500 miles and 50 cents for 1000 miles. Exhibition horses are insured for fifteen days and thirty days for $1.50 and $2.50, respectively. The minimum premium for any policy is $5.00.

Besides these specific policies, groups of horses may be insured. There are some deductible policies in which the insurer stands the first loss and the company the other losses. The deductible policies are much cheaper as they offer less protection. These policies make it possible for the owner to have some protection that would be very valuable if his losses were excessive.

Anyone wishing to insure horses should consult the nearest local agent. If there is no local agent, arrangements may be made by writing the company's main office.

(The above is an excerpt from "The Western Horse," by John A. Gorman, printed by The Interstate Printers and Publishers, and for the convenience of the readers the book may be ordered through the Farmers Digest. $1.65.)

The WESTERN HORSE is one of those exceptional books which not only gives you all the facts on how to train and care for western horses, but tells it in an interesting manner. The book covers a wide field. It describes the various types of western horses, how to break them for riding and roping, and even how to make trick horses of them. One chapter goes into detail on how to ship horses by rail, truck and trailer. We recommend this book to all horse owners, even though they may live in the south or eastern part of the country.

Farming with a Pencil

Condensed from Kansas Farmer

Roy Freeland

A modern trend among Kansas farmers suggests more wear and tear at the elbows of shirt sleeves. It is caused by increased use of an old-time "implement," the common lead pencil. Ordinary and simple as it may be the pencil is praised by many farm operators as an important part of their farming equipment.

These men point to the fact that present-day farming is a complicated business. Problems of running a farm are just as important and involved as those which confront bankers, merchants and other business men. Bankers and merchants simplify their problems by careful bookkeeping, and the same practice is serving as a valuable guide for "business men in overalls" who keep accurate farm records.

Right now these farmers are checking over their records of 1940 to determine what crops and livestock were most profitable. They are scrutinizing feed costs, production costs and labor expenses to find the "fly in the ointment" on projects that didn't return favorable profits. This being the start of a new year, they are also taking inventory of grain, feed, livestock and machinery. They suggest that if you plan to keep records, now is the best time of year to start, because it is the logical time to take inventory of your farm possessions.

Farm bookkeeping in Kansas is done under a variety of different methods, using different types of farm account books. Probably the most thorough and comprehensive farm accounting is done by farmers who are members of Farm Management Associations. At present, 430 farmers, in 51 counties, are co-operating in 3 farm and home management associations located in Southwest, South Central and Northeast Kansas. These associations are supervised by extension farm accounting experts who supply practical management and marketing information in addition to summarizing the farm records.

Each place is supplied with a farm account book and a home account book, in which farmers and their wives can keep a complete record of the business and of the personal and household expenses for the year. The books are well organized and arranged so that a minimum of time spent on records gives a maximum of

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information. At the end of the year, both the farm and home account books are summarized, and a complete analysis of each is provided for the family.

Each association has a fieldman who makes 4 visits to every farm during the year. He gives attention both to the matter of keeping good records and to problems of organization and management. Weekly newsletters are mailed to all co-operators. These letters contain suggestions for keeping accounts, and price trends of agricultural products. Members in each county meet from time to time during the year to exchange ideas about most profitable crops and methods.

The records prove of great assistance in filling out income tax reports. This is of particular value at present because of new regulations requiring more complete income tax reports from farmers.

Along with the bookkeeping, leaders of farm management associations encourage sound practices of production and marketing. For instance, hog producers are encouraged to raise 2 litters a year from each sow. It is advised that the pigs be farrowed in March and September and finished for market in 6 months, to be ready before the periods of seasonal price slumps.

This plan was adopted by Ralph Hornbaker, of Stafford county. Until recent years, Mr. Hornbaker planned for his pigs to come in April and May because of more favorable weather conditions. Records show the change to earlier farrowing has adjusted his former weakness of having hogs ready for market when prices were at the lowest mark each year. Mr. Hornbaker is convinced that accurate bookkeeping has been a big help in enabling him to increase the profits from all phases of his business during the last few years.

O. F. McGonigle, of Reno county, has made exceptionally good use of farm records to increase profits from cattle feeding. By an accurate check on weights and prices, he has been able to evaluate his different feeds and pasture grasses. This has resulted in a better selection of feeds and a more efficient pasture system on his place.

Farmers in Western Kansas are learning from their records that good wintering of high-quality cattle for feeders is more profitable than roughing common cattle for stockers. In Cowley county, accurate records kept by Ira Wilson, one of the leading farmers in that area, show profits from diversified farming program based primarily on alfalfa, wheat, cattle and hogs.

Early spring lamb production is another practice that has proved highly profitable on the record books. Ewe flocks of many farm management association members had finished lambing by

late November or early in December. These lambs will be ready for market during April and May, well ahead of the time when lamb prices can normally be expected to weaken under pressure of heavy market receipts from other territories.

Summaries of farm records include an accurate analysis of all feeding projects. A completed analysis shows amount of gain, cost of gain, profit on gain, and profit or loss from price changes. Feed produced on the farm is shown separate from purchased feed, to help give the farmer a true picture of his farming business.

In addition to summaries for each individual place, the farm management associations prepare charts and tables to illustrate how each farmer's costs and returns compare with those of other members in that area. This service is valued highly by H. E. Everston, of Osage county. He relates, "I like to compare my records with results of the records kept by others. This helps me analyze my business."

Three fieldmen for the 3 Kansas Farm Management Associations include: W. J. Conover, Clay Center; H. A. Biskie, Wichita; and Leonard B. Harden, Holton. Farm management and accounting work of the entire state is co-ordinated at Manhattan by two supervisors, J. H. Coolidge and Luke M. Schruben, extension economists, of Kansas State College.

Years of work with farmers who keep records have enabled them to observe practices and conditions which determine profits and losses. As explained by Mr. Coolidge, a good size or volume of business is one essential for a large income and a sound long-time program. Proper combination of enterprises or a good balance of crops and livestock is also necessary for dependable income over a period of years, he says. High production per unit, efficient production, and a systematic marketing program are other factors which have been important in influencing profits. Time of marketing farm products has much to do with net income, and farmers who keep books are seeing the value of marketing at times when prices are normally favorable.

Whether they belong to a farm management association or do their own bookkeeping, farmers who keep records are becoming better business men. They understand their own business better than ever before, and they have learned that a record is much more accurate and dependable than memory.

4-Leaf Clover System of Pruning

Condensed from **American Fruit Grower**

Norman F. Childers

Ohio State University

IN northeastern Ohio considerable interest has developed regarding a system for training and pruning fruit trees known locally as "The Four-Leaf Clover System." This method of pruning was conceived by W. T. Mann and L. G. Dean, of the Grand River Orchards Company, where it has been in use on a commercial scale for the past 10 or 11 years. Because of certain advantages of this method of pruning over conventional methods, and also because of the fact that it has been used successfully for a period of years by one of the largest orchards in Ohio, it would appear to be worthy of mention.

The Four-Leaf Clover System of pruning differs from conventional systems in two main respects. First, the tree is trained into four distinct quarters by holding open as the tree develops two channels one and one-half to two feet wide through the center of the tree, one channel running from east to west and the other from north to south; and second, the tree is held within a spread of 20 to 22 feet and a height of 16 to 18 feet by more or less annual trimming.

While the idea of opening holes in the sides of trees and holding the height and spread within bounds is not new, the system by which it is carried out by these growers probably is more systematized and simplified. The four channels or wedges into the tree are arranged so that they always occur in a definite position, as, for example, on the east, west, north and south sides in line with the rows.

The trees are held within bounds by placing a 10-foot pruning pole against the trunk of the tree beneath each quarter and removing all growth which grows beyond the pole. As the pruner encircles the tree he enters each wedge and removes, clips or cuts toward the side any twigs which are growing into the so-called open channels. After this he climbs an eight-foot stepladder placed consecutively in each open wedge and removes twigs which are growing upward beyond his reach. Whether or not he performs moderate, if any, ordinary detail pruning of branches within

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each quarter will depend upon the need for it and the prospects for a crop the following summer. This is determined by inspecting the number of fruit buds and the amount of mulch beneath a tree.

If it is evident that the tree was mulched (indicated by depth and freshness of mulch) the past spring, it is taken for granted that it was carrying a relatively heavy crop; if it were not mulched the crop was light. By a system of performing somewhat more trimming preceding years of heavy crops for an individual tree and less trimming preceding years of small crops, Mr. Dean has found it possible to prevent an over-vegetative condition.

The first impression to an outsider who hears of this system of pruning, is to classify it as moderate to severe, and more likely severe. However, it is clearly evident on visiting the orchard in July or August that the trees are not over-vegetative. In fact, it is difficult to find a shoot which could be classified as a water sprout. This may be due to the fact that what few sprouts are present in June are removed as a part of the fruit thinning program; but, probably more important, it is due to the relatively small cuts which are made during the winter pruning.

Each pruner who is held responsible for a definite section of the orchard is instructed to make rarely, if ever, a cut larger than three-fourths inch. Instead of using the word "cut" or "prune" in giving instructions to these men, the word "nip" is used. As a result, the foremen and crews think in terms of "nipping."

By having the pruning job so definitely laid out to pattern for each tree the men are able to tell from year to year why certain "nips" were made the preceding year. In other words, if a limb an inch or two inches in diameter at the base were present in the open wedge and were obstructing the passageway through the tree, it would not be removed immediately but would be nipped back each year to spurs or twigs bearing fruit buds until the limb after four or five years had become so weakened that it could be removed without causing water sprouts to appear at the point of removal.

The fact is impressed upon the men that water sprouts are largely wasted energy as far as fruit is concerned and no type of cutting should be done which would promote them. In addition, they are aware of the fact that any type of cutting on a branch, whether light or severe, is correspondingly a dwarfing process, especially to that limb and to a somewhat lesser degree to the tree as a whole.

This nipping at a branch over a period of two or more years is practiced on small branches as well. Even branches three-eighths

to one-half inch in diameter are removed only after two or three years of nipping. The main object, however, in not removing the limbs immediately is to obtain from them a peck or three to four bushels of apples.

Probably the greatest value in having the tree divided into four quarters and held within limited width and height is the fact that each quarter has the advantages of a 10 to 12-year-old tree from the standpoint of penetration of light, efficiency in spray coverage and ease of thinning and picking. Portable sprayers are used in the Grand River Orchards, although this type of tree would be adapted especially to stationary spraying. The two men riding the rig both spray with the wind, one covering the upper two-thirds of the tree and the other spraying the lower one-third or one-half of the tree from the rear platform of the rig. For example, as the first tree in a row is approached from the west (wind from southwest) the spray is directed toward the north, each man covering his portion of the tree in the following fashion: (1) Into the west "V" by a steady downward sweep; (2) then up, down, up, covering the first quarter from the outside; (3) down, steadily down in the south "V" allowing the force of the spray to drive it in a swirling fashion through the tree, then up fast in the south "V"; (5) switch to the next tree and down in its west "V"; (6) then back to first tree to shoot spray directly into the east "V," and so on.

The thinning and picking operations are simplified considerably by the open channels. The picker or thinner carries his eight-foot three-legged stepladder into each "V" and is able to thin or pick all about him as well as inside each quarter. Most of the outside of the quarters is picked from stepladders which eliminate the weight of ladder and man pressing against closely matted groups of apples and knocking them to the ground.

When trees are held within definite bounds, several improvements are claimed by these growers over conventional systems of pruning. In the first place, a large tree, according to their records, is expensive to prune, thin, pick and especially difficult to cover completely with spray material. The question arose with them, therefore, as to whether they desire to save money on the pruning operations and allow the tree to grow large, or keep the tree small and save on several orchard operations with the additional likelihood of higher grade fruit. Likewise, they are in agreement with the observations and data obtained by F. H. Beach, in Ohio, that most growers can and do cover their trees fairly well with spray to a height of 15 feet but above this height the codling

moth and scab become progressively greater.

The small trees when maintained within approximately a 20-foot width can be planted 50 trees to the acre as these growers have done, and the land can be cropped more efficiently. They are of the opinion that 50 small trees to the acre which bear their crop throughout the tree are more valuable than 32 large trees which bear their fruit on the periphery with their centers almost devoid of fruit and leaves. By their type of annual or biennial trimming they have demonstrated as far as they are concerned that it is possible to prevent these "dead centers" from developing and at the same time not induce an over-vegetative condition. That they have not reduced yield by this type of pruning is shown for six varieties in the accompanying table.

Each year over the six-year period the total fruit crop from this orchard graded out between 80 and 85 per cent Extra Fancy, five per cent culls or unclassified and the rest U. S. No. 1. Sizes for the better grades ran from two and one-half inches up, but largely in the two and three-fourths to three-inch sizes.

The trees from which data are given in the accompanying table had received very little or no pruning until they were 13 years old. This was in line with an earlier pruning program of this orchard. Because at that time the trees were becoming difficult to manipulate, Mr. Dean conceived the idea of the so-called open channels. In addition, he found later that by performing most of a "fanning" operation on Rome Beauty filler trees the winter preceding a heavy crop, he could produce large sized apples and at the same time prevent the appearance of undue sucker growth. Hence, from this the idea developed of attempting to keep the permanent trees within limited bounds by judicial trimming. The Four-Leaf Clover System was started, therefore, on the above trees in about the year 1929 but the trees were not considered to be fully converted to this system until five or six years later. Of course, the slow conversion was done primarily to prevent the occurrence of sucker growth and sunscald. In a few instances where the trees were opened too hurriedly by less careful workers, bare limbs were left openly exposed and scald resulted.

In a few cases where there is danger of splitting, especially on Baldwin and Jonathan, the trees are braced two-thirds distance up the limbs with heavy wire. Mr. Dean's records show that the materials and labor involved in such bracing is less expensive than labor required to cut bracing poles and carry them to and from the trees each year. Due to the relatively short main limbs of

trees pruned to the Four-Leaf Clover System there is less leverage involved and wire bracing appears to suffice each year.

More recently with newly set trees Mr. Dean has selected the main limbs shortly after planting with the true Four-Leaf Clover System in mind. His ideal tree is one which has the lower limb about one foot above the ground on the southwest side of the trunk (if rows are running east and west), the next limb on the northwest side six to eight inches above the first, and the third limb arising on the northeast side six to eight inches above the second. The center trunk then continues straight for eight to ten inches where it is cut toward the northeast to account for the northeast quarter of the tree.

Thus, in many respects these trees are started similar to most apple trees today except that in early training attention is given to keeping the two channels open from north to south and east to west. Sometimes it is almost impossible to obtain one good main limb for each quarter, and this is especially true on two-year trees from the nursery which already have their framework partially established. But it is not entirely necessary that only one scaffold limb comprise the full quarter; two or three smaller ones could serve as well provided they were not directly parallel, one above the other.

Probably an ideal system of starting the trees, according to Mr. Dean, would be to plant one-year vigorous whips 30 feet apart both ways and cut them back to 33 to 36 inches. Then deshoot them when the shoots are four to six inches in length, leaving only those three or four shoots which are approximately in the desired position.

In conclusion, it could be stated that while this system of pruning and training may appear sound, in many respects it should be taken into account that it has proved successful in only one orchard which is well situated from the standpoint of climate and color development in the fruit. This region likewise is troubled with but one to one and one-half broods of codling moth, and practically no Brooks spot, blotch or bitter rot. It is interesting to note, however, that this orchard has proved successful in spite of the poor type of orchard soil upon which it is growing. The soil is a fairly heavy clay loam which permits only two to two and one-half feet of rooting. This in itself would indicate, under shallow rooting conditions, an additional advantage of the Four-Leaf Clover System of pruning in keeping the treetops relatively small and within reasonable proportion to the limited rooting. It should not be overlooked also that with an increasing and almost uncontrollable codling moth

situation in some fruit regions, the smaller trees or open channels characteristic of this system of pruning may have a special advantage in aiding with a more complete coverage of the fruit with spray material.

The Four-Leaf Clover System of pruning has not been tried on other tree fruits except on a small scale with plums and cherries where it evidently has about the same advantages as outlined for apples. It probably would not apply so well for peaches and pears.

Yields of six varieties of apple trees pruned to the Four-Leaf Clover System. (Includes only fruit packed out of storage.) The Grand River Orchards Company, Geneva, Ohio. 1934-39, inclusive. Trees 23 years old in 1939.

Variety and Number of Trees	Yield in bushels per year						Av. Yld. Per A.
	1934	1935	1936	1937	1938	1939	
McIntosh (206)	2105.5	5358.5	2062.75	4086.0	3749.5	.....*	842.8
Delicious (213)	1742.25	1805.25	1591.25	1505.75	1688.5	1522.0	386.6
Northern Spy (281)	3671.25	2028.5	2944.75	1330.25	3030.0	202.5	391.7
Rome Beauty (298)**	2301.25	1770.25	1871.25	3043.25	1467.75	2907.5	373.5
Twenty Ounce (126)	1845.0	1907.0	2119.75	1349.0	1328.5	1844.5	687.4
Boiken (188)	1740.5	1619.25	1208.5	1343.5	1437.0	1204.5	379.1

*Young McIntosh trees came into bearing and yield was pooled with fruit from older trees; no accurate record for older trees.

**Includes about 30 Ensee trees, the fruit from which was pooled with the Rome Beauty.

Harness Conditioning

Condensed from The Dakota Farmer

THE life of well-made harness depends not so much on the work and strain it has to stand, as on the care given it. A harness well cut from good leather—not too thin and with no cracks showing up on the grain side when the strap is bent—kept pliable, will last through a lot of hard work.

Leather is extremely porous, and those pores must be well loaded with grease, to keep out moisture and prevent cracking. But not too much oiling—there is a knack to properly caring for harness—or the leather will stretch out of shape under strain, and perhaps take up sand and grit.

Winter Damage

If harness is hung in the barn after fall work is over and left there without care during the entire winter, it will not be as good harness by spring—unless it was conditioned before winter sets in. The moisture and the acids from closely confined livestock are not good for harness when kept in the barn proper, and not in the harness room.

A fact not often mentioned is that practically all leather contains a little sulphuric acid as the result of tanning processes. An excessive amount of this acid tends to rot leather, so one of the reasons for soap-washing of harness is to help neutralize the acid with the lye in the soap.

After all dirt accumulation has been scraped off, with a sharp piece of wood or a dull knife, harness should be washed with soap, using a sponge or a stiff brush—some people prefer one, some the other. A commercial harness soap, castile or white toilet soap, are good. Many prefer especially prepared "saddle soap," claiming that the lye in other soaps removes too much of the surface oil on harness, and that it is difficult to restore that and prevent cracking, without putting on too much oil and leaving the leather greasy. Saddle soap itself contains animal oil.

Oiling Leather

It is a common mistake, especially in conditioning used harness that has been let go without attention for a considerable time, to use too much oil. It is better to use just a small amount at a time, a couple of tablespoonfuls for a complete harness and to oil oftener.

Old timers are often seen oiling harness with more care than a housewife uses in polishing silver, and there's a reason: leather is so porous that care and skill

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is needed to have it absorb oil evenly. So long, light, quick strokes with an oiled rag are needed to prevent soaking up too much oil in spots, and to get even distribution. Oil applied on the flesh side of leather penetrates more evenly.

After washing, harness should hang in a warm place until it is no longer wet. It should be oiled while still somewhat damp. After oiling, the harness should stay in a warm place over night, before it is rubbed down with a cloth to remove surplus oil.

Neat's-foot oil of course makes a good leather dressing, but many people prefer to use a mixture of neat's-foot oil and tallow on heavy work harness—or neat's-foot oil, tallow and wool grease, worked into a buttery paste.

Metal Parts

The metal parts of harness should not be gone over with any abrasive, such as emery paper or emery cloth—use nothing that will scratch. A sharpened piece of wood will dig out and scrape off dirt and mud, and a polishing liquid will brighten the parts.

A Shot in the Silk for Corn Ear Worm

THE entomologists have been trying for many years to find a way to get the best of the corn ear worm which mars so many otherwise excellent ears. Dr. L. A. Carruth, of the Geneva Experiment Station, has been at the thing a decade and now he comes out with Geneva Circular No. 190 which may be had on request from the experiment station there, entitled, "The Corn Ear Worm and Its Control."

One of the factors in control is the timing of the crop as the ear worm does not do very serious damage upstate until well towards September. Long Island, however, has two broods with one peak in July and the other one from the latter part of August on.

Under extensive grower trials for the first time last year, was the mineral oil treatment devised by Dr. G. W. Barber, of the U. S. D. A. This is still in the development stage and should be tested on a limited scale. Some skill, however, is necessary to get just the right amount on the silk and to avoid interference with pollination and kernel development.

The treatment consists in giving the silk at the tip of the ear a shot of mineral oil by means of a little injector which is now on the market. Anyone who wants to play with the new scheme should, by all means, get hold of Carruth's circular. The try-outs will not be very expensive.—*Paul Work, American Agriculturist*

Grass Silage

Condensed from The Jersey Bulletin

C. B. Bender
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and
E. S. Savage
Prof. of Animal Husbandry, Cornell University

GRASS silage" is made from any uncured hay crop—whether it be a true grass such as timothy, a legume such as alfalfa, or a green cereal such as oats. Terms like "alfalfa-molasses silage" or "timothy-phosphoric acid silage" describe specific kinds of grass silage.

The grassland system of farming is as old as history. In this country, however, it fell into disuse wth the coming of the cash crop system. Cash cropping paid good dividends until soil fertility was sold from the farms and erosion took its toll in terms of top soil carried to the sea.

Grassland farming, as thought of here, would place more emphasis on grass and legume crops, but not to the exclusion of other crops.

Pasture and hay fed to livestock and converted into meat, milk or wool are excellent cash crops and the cash returns are usually larger, more sure, and better distributed throughout the year. The value of pasture has long been known and appreciated as an ideal food for livestock. Pasture produced on soils rich in fertility and harvested by the stock themselves has been the means of correcting the mistakes made in feeding livestock in the winter. Pastures well managed and fertilized pay excellent dividends.

The making of legumes, grasses and cereals into hay is the most common means of preserving roughage for winter use. Due to the uncertainty of the weather, hay is extremely variable in quality. As much as thirty per cent of the feeding value of the crop may be lost.

Two weak links in grassland farming are the losses in haymaking and too much early pasture grass followed by too little mid-summer growth. Since the development of methods by which hay crops and excess pasture can be preserved as silage, those weak spots have been largely eliminated. Through a well planned program of fertiliza-

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tion and manuring, the pastures should remain productive indefinitely and the haylands should be productive for several years. Under this system the crops are harvested and stored when they are high in feeding value and the soil erosion problem is under control.

A third weak spot is the lack of production of home-grown grains or other concentrates such as soybeans, and the lack of bedding. Good management can work such crops into the rotation and solve these problems. Barley, or barley and oats, may be grown for grain and straws as nurse crops for new seeding. Corn or soybeans may be used in the rotation for grain or silage, depending upon soil type and topography. Farmers should study the possibilities of a grassland and grass silage problem because of its flexibility.

Experimental work has established the fact that a satisfactory grade of silage can be produced from green hay crops by the addition of molasses. Good silage has also been made on a number of farms with phosphoric acid as the preservative. Analyses and feeding trials show that a pound of digestible dry matter in grass silage is about equal to a pound of digestible dry matter in corn silage.

In determining the proper place of grass silage in the program of any farm, the operator should ask himself how well grassland farming meets the needs of his particular farm and to what extent grass silage can be profitably used to supplement pasture, to replace hay and to replace corn silage.

There are two distinct groups of factors that must be considered:

1. The amount of grass silage that can be profitably incorporated into the ration of farm animals. For example, to what extent can the dry hay in the ration be replaced with grass silage without decreasing the total nutrient intake from roughage?

2. There are many factors regarding the use and place of grass silage that are individual farm problems. In other words, a sound program for one farm might prove unsound for another.

Almost all farms are faced with a pasture shortage sometime during the summer. Practically every argument favors the production of grass silage to supplement short pastures. Obviously, the relation between the number of animals and the diameter of the silo must be such that the silage be fed fast enough to prevent spoilage. The silage can be stored during unfavorable weather conditions when the production of quality hay is difficult or impossible. The silos can be filled again in the fall with corn, grasses, or legumes.

On farms where the yields of corn for silage are satisfactory

there are arguments that favor its continued use. In the first place, corn is harvested late in the season. The replacing of corn silage with grass silage (with the exception of soybeans or other annual crops) may on some farms increase the labor load during June and July. Individual farmers must figure out these problems for themselves.

Secondly, corn in the rotation offers some crop insurance. Hay makes its maximum growth in the early season and corn from midsummer on. In the case of very unfavorable weather conditions during the early growing season, corn might easily prevent a crop failure and a feed shortage. Soybeans, or soybeans and sudan grass, however, may be used for the same purpose.

Third, corn provides a cultivated crop in the rotation. Following legumes corn seems to be the crop capable of making the maximum use of the plant nutrients stored in the soil.

Unfavorable weather conditions frequently make the production of quality hay difficult. Heavy losses both in quality and in nutrients are not uncommon. The weather is not an important factor in making grass silage. It has also been demonstrated that the losses relative to grass silage when properly made and stored are significantly less than in the curing of hay under unfavorable weather conditions. These two facts strongly recommend the practice of making silage out of part of all the first cutting hay.

If the normal amount of corn silage is produced and part or all of the first cutting hay is made into silage a larger amount of silage must be fed than has been commonly recommended. Experiments are under way to determine the proper relationship between hay, silage and concentrates in the feeding program. A certain amount of hay is needed. This can be provided from second cutting and that part of the first cutting secured when the weather is favorable.

In seasons when rainfall is adequate some pasture fields may not be needed for early grazing. The best use of this crop is for hay because of the fineness of the stand. This crop cures readily and is of fine quality. Therefore, if hay is needed it is recommended that this first cutting of pasture be cured for that purpose. This fine quality hay made from pasture is excellent for feeding young calves. If not needed for hay it may be used for grass silage. In general, it must be taken off early to insure high quality hay or silage and good pasture later. The exact time of cutting is a matter of individual pasture management. However, since hay plants will yield more material for the silo than pasture plants, it may prove desirable on many farms to reduce pasture

acreage, increase hay acreage, and then graze second growth or first growth if needed. Stands of hay are knocked out by late fall grazing unless carefully controlled.

Long continued experiments have shown that the productivity of the average soil declines about two per cent per year when planted to a cultivated crop like corn even when erosion is not a serious factor. On steep slopes the decline is much more rapid. A dense grass-legume sod gives satisfactory erosion control under practically all conditions. As long as a satisfactory stand and good growth of the legume is maintained the nitrogen requirements of the crop will be supplied from the inexhaustible, free supply in the atmosphere. The most fertile soils in the world have developed under a grass-legume cover.

Of course, considerable amounts of lime, phosphorus, potash and other elements essential for plant growth are removed from the soil in the silage crop. A large proportion of these elements pass into the manure and if it is properly handled and returned to the soil the rate of depletion can be greatly retarded.

Fire destroys 150 million dollars worth of farm property in the United States each year. Twenty per cent of this loss is accounted for by spontaneous combustion in stored hay. The more grass silage that is made, the less hay will be stored in a form subject to spontaneous combustion.

Large savings in barn construction costs can be made by planning to store hay crops as silage. Silos will provide the necessary storage space at about the same cost per cubic foot as a conventional hay mow, and each cubic foot stores over three times as much feed, as is shown by the following table.

These figures are rough averages, but they explain why some farmers who have lost their barns by fire are building one-story stables with hay barrack and silos for roughage storage. Such buildings can probably be built for less money than conventional two-story barns designed to take care of the same amount of stock.

	Whole Hay Lbs.	Baled Hay Lbs.	Grass Silage Lbs.
Feed stored per cubic foot	5	10	45
Dry matter stored per cubic foot	4	8	14
Cubic feet per ton of feed	400	200	44
Cubic feet per ton of dry matter	500	250	147

Kansas Grasses Walk to Market

Condensed from The Shorthorn World

A. D. Weber

Kansas State College

JOHN J. INGALLS started his famous essay on grass by saying, "Next in importance to the divine profusion of water, light, and air, those three great physical facts which render existence possible, may be reckoned the universal beneficence of grass." And another great Kansan, W. J. Tod, of Maplehill, once said, "Kansas grass is one of the most important crops—perhaps the most important crop in the state."

Bluestem is the most famous Kansas grass. It grows profusely in the rough area in the central and southern portion of the eastern half of Kansas, commonly called the Flint Hills. As many as 500,000 head of cattle have been brought into Kansas and grazed on the native grasses of the Flint Hills in one season. While considerably fewer than this number were brought into the Flint Hills last season, the pastures are more nearly filled than was thought would be the case early last spring.

In fact, many persons feared that these wonderful pasture grasses would die following the droughts of 1934 and 1936. And from all outward appearances one would have concluded that they were dead. But with the return of more nearly normal rainfall they made a wonderful recovery in one season. And in the summer of 1939 Kansas bluestem made as luxuriant a growth as it used to before the droughts. Our recent experiences with these native grasses serve to emphasize their wonderful adaptability to this region.

Cattle move to the Flint Hills pastures during April and early May. Leases commonly terminate October 15. Thin, aged steers from Texas were formerly grazed in large numbers in the Flint Hills. These older steers if thin at the start of the grazing season often made 250 to 300 pounds gain. Most of these aged steers fattened on grass and were marketed in July, August, or September. Studies made under normal conditions revealed that from 40 to 60 pounds of gain were made per acre of grass.

But economic conditions have changed. Fattening aged steers is no longer the most important grazing enterprise in Kansas. The reason for this lies in the fact that

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an increasing demand for lighter carcasses has developed in recent years. As a consequence, the supply of older steers has decreased materially.

New problems have arisen as a result of these changing conditions. Manifestly the supply of grass fat cattle turned off from Kansas pastures is much smaller now than it was 10 or 25 years ago. Yet the only way that these grasses can be marketed is through livestock, and as a general rule that means through beef cattle.

On the ranches in the Flint Hills which produce some feed crops, roughing stockers through the winter and then grazing a full season is a practical way to market grass. Thin, young cattle will gain 200 to 250 pounds during a full grazing season. This system is not speculative because stock calves are bought and yearlings are sold on the same market. It should be said that wintering yearlings and grazing them as two-year-olds is another practical method.

But there are ranchers in this section that do not produce any roughages for winter feeding. Or if roughages are produced the supply is not nearly sufficient to winter the number of cattle that can be pastured. In these cases it is probably best to lease the grass to an outsider. Sometimes arrangements can be made to buy stockers in the fall, contract for their wintering and then graze them a full season. In either event it is likely that young cattle will be used.

Many farms and ranches in the bluestem area produce not only grass, but roughages and grain. Set-ups of this kind are especially adapted to cowherds, which represent the safest and most practical system of beef production over a period of years, which is available to Kansas cattlemen. And in most instances the returns from grass and other crops can be increased by creep-feeding the calves.

There is another method of utilizing bluestem grass in fattening calves that has proved profitable at the Kansas Agricultural Experiment Station and on many farms and ranches. This method consists of wintering good quality steer calves well, grazing 90 days without grain, and then full feeding 100 days in a dry lot. A modification of this method that has proved satisfactory consists of wintering well, grazing 90 days without grain, full feeding on bluestem grass 40 to 60 days, and then full feeding 60 to 40 days in a dry lot. This modification has an advantage in that it is somewhat easier to get the yearlings on a full feed of grain while they are on pasture than it is in a dry lot. On the other hand, packer buyers seem to prefer the cattle that have been fed in a dry lot for the full 100-day period.

Blue grass and brome grass are commonly found in that section of Kansas east of the Flint Hills. The methods of utilizing these grasses are similar to those just outlined for bluestem grass. However, the farms are smaller in this section and the owner of the farm usually owns the cattle used in marketing the grass. Small cowherds and a deferred system of full feeding are both well-adapted to this area.

Then there is the short grass area of western Kansas with its buffalo grass as the mainstay of pastures. Unfortunately much of this grass was plowed up. But there are still many wonderful ranches in the southwestern section of this state. Cowherds with the production of feeder calves is the most important method of marketing grass in this area.

In closing I should like to quote again from the statement of the late W. J. Tod concerning Kansas grass. He said, "When you consider that we have still over 14½ million acres of native grass and nearly a million acres of other grasses, and that the Kansas native grass for at least a third of the year cannot be excelled, if equalled, as a beef producer, we may realize what a wonderful asset we have in our grass lands. These millions of acres of grass, capable of producing in the summer months alone say fifty pounds of beef per acre and during the winter months affording roughage for the vast herds we carry over, show what a splendid inheritance we have in our grazing lands."

Two Gardens Instead of One

Condensed from Missouri Ruralist

Cordell Tindall

LAST summer a group of farm people in Cass county, Missouri, received wages of $4.11 an hour. And they were working for themselves. This was the average profit for labor from their family gardens.

Two clubs of young couples in that county are demonstrating what attention to good gardening practices can mean in dollars and cents, as well as in good health through good foods. They are following new methods that have completely revised their ideas of vegetable production.

Now is a good time to be thinking about garden plans for the coming season, and perhaps you can obtain some helpful ideas from the experiences of these young folks in Cass county, for they have something new to offer in this oldest of agricultural arts —producing food.

Several years ago the first Rural Youth Club to be organized in the state was set up in Cass county. These clubs are common now, and as you may know are for young farm people too old to participate in 4-H Club activities.

So a group of young farm couples, known as the Pioneer Club, ranging in age from 20 to 35 years old, organized for recreation and education. Searching about for some project that would be of common interest to all members, they decided on gardening. For what farm family doesn't concern itself with a garden?

The Pioneer Club now has carried on its garden work for 3 years. Another similar club, the Rock Ford Club, took up gardening for the first time last year. Tours are held in the summer to see the gardens and a year-around program is held with 2 meetings every month, one in the daytime and the other in the evening.

In attacking the problems of better farm gardens, the groups have found one situation almost universal. Rarely is the garden spot ever changed.

Mr. and Mrs. Vern Gross, near Archie, who have been prominent in this garden work, tell of a typical situation along this line. This young couple moved to their present farm in 1934, but the garden spot had not been moved since the farm was settled in 1866.

Now, as Mr. Gross asks, who would think of growing corn or

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wheat on one piece of ground for 75 years? That sounds ridiculous. But gardens are put to the same crops year after year, and we think the ground works better for it.

The Pioneer and Rock Ford Clubs worked out, with the help of specialists from the Missouri College of Agriculture and their county agent, Horace Hunt, a system of garden rotation. And it's so simple they wonder why they never thought of it before.

For the most part the members of the clubs are using 2 garden areas. You may say this is a waste of space, but as the garden area returns much more to the acre than any other spot on the farm we can easily devote more space to it.

While one area is being used for growing vegetables, the other is being built up with green manure crops. Early in the spring oats are sown. These are plowed under before they mature and then soybeans are put in. These soybeans also are plowed under before they mature, and sometimes winter vetch is planted. Vetch is a winter legume, and so by using these 3 crops there is something growing on the ground all the year.

The Grosses not only have 2 garden areas, they rotate the area now in vegetables, too. The garden is divided into space for early vegetables and late vegetables. The ground for late vegetables is put into oats. These are turned under in the summer and the late vegetables planted. The ground for the early vegetables is cleared off as soon as they are out of the way and vetch is sowed. This was plowed under in December this winter.

Mr. Gross will tell you that he has found this system of soil building to be highly effective. The organic matter added to the soil makes it work much better and the dry spells in the summer have not hurt his garden as much as in former years. The ground is more friable and does not bake hard.

Organic matter in the soil has also added to its capacity to hold water. A stock pond is at one end of Mr. Gross' garden. In former years much of the water in this pond came from run-off from the garden. This last year Mr. Gross noticed that little water ran off the garden into the pond.

Still another advantage has been found for this system of garden rotation. By clearing off the ground for a green manure crop weeds never get a chance to mature seed. Instead of the soil being idle except for weeds, there is a crop growing on it. A few years of this system and there is a noted decrease in the numbers of weed seeds in the soil, and so the work of hoeing weeds is reduced.

So effective is this system of gardening that the Gross family

of 5 now puts in only about half as much land in garden as before. The soil has been so built up and dry weather troubles so reduced that they can raise more vegetables on less ground.

Quality of the vegetables has been greatly improved, too. The vegetables naturally taste better, being of high quality. And it's not all taste either, for the vegetables grown on the good, rich soil are better food than those grown on land where the fertility has been robbed.

"We are learning the value of liming and fertilizing land in producing livestock feed," Mr. Gross says, "but many of us go right on raising our own food for the table on the same spot year after year."

This new idea of rotating gardens is not the only modern practice followed by the members of the clubs. From the beginning of their garden activities they gave attention to the details. Only recommended varieties of seed are planted. The clubs pool their order and buy bulk seed from reliable seed houses. Recommendations of the Missouri College of Agriculture are followed for varieties chosen.

Several members have built hothouses and are able to get in an early garden. This is especially true in the case of tomatoes. We all know that the only money that can be made from tomatoes is from the very early ones. Cabbage plants also are propagated in the hothouses. This year the Grosses are planning to use protective cones to get out plants even earlier.

Planting of the various vegetable crops is so planned that successive plantings are made. The needs of the family are roughly calculated but all beans or peas, for instance, are not planted at once. Plantings are made about every 10 days, so that there will always be a fresh supply of crisp, mature vegetables.

Mr. Gross has discovered one handy idea in planting his garden. After working it down he lays off the rows with his corn planter. That is, he uses the planter for marking the rows. The planting is done by hand, but the rows are already marked off evenly and correctly spaced for cultivation with the corn cultivator. This cultivation with the teams certainly cuts the labor of gardening.

Emphasis is placed by the club members on insect control, too. Dusting is preferred by most of the members, and the dusting is done before the appearance of the insects. In such crops as cucumbers, the dusting has proved especially profitable.

A wider variety of vegetables is being grown by the gardeners now than they ever had before. Salsify, broccoli, egg plant, and many other newer vegetables are being tried with good success.

Of course, a big part of the garden program has been the canning and storing of vegetables. Adequate storage facilities have been made and extensive canning programs worked out. Demonstrations have been held in canning and preserving food.

Mrs. Gross now has around 600 quarts of fruit and vegetables in her storage cellar, part of this being left from last year. You can imagine what a supply of fruit and vegetables like this does to a grocery bill. A little pork and beans has been about the only canned food bought all winter.

The results of this program of gardening have been recorded in dollars and cents by some of the members of the 2 clubs. Accurate records were kept, not only of the produce but of labor as well.

The high return that a garden pays is shown by these average figures. Average size of the gardens was .59 acre. Only $7.01 cash was expended on the average. Labor was 42 hours of man labor and 18 hours of horse labor. The value of the fresh vegetables was $43.30. Canned vegetables were figured at $51.31, and stored vegetables at $46.91.

This makes a total value of $149.99 with $142.98 profit. The labor return is thus $4.11 an hour.

One of the most promising results of the program has been the adoption of many of these gardening practices by neighbors not in the clubs. Mr. Gross cites several examples of families in the community taking up the 2-garden idea, and wondering why they hadn't thought of it before.

Potatoes as Livestock Feed

Condensed from The Western Farm Life

DURING the past few years the practicability of feeding potatoes to livestock has been brought to the fore with large supplies of cheap potatoes.

Tests at various experiment stations have proved that potatoes can be fed successfully to all kinds of livestock. The tubers have been found to be similar in food value to corn silage and to contain double the digestible nutrients found in beet pulp or beet tops. Four to 4½ pounds of potatoes will supply nutrients equal to the amount found in 1 pound of an average grain mixture. Therefore, from a dollar and cents standpoint a feeder can afford to pay one-fourth as much for potatoes as for grain mixture.

Comparison of total digestible nutrients in potatoes and alfalfa show potatoes to be one-third as high. On this basis the tubers are worth as much in cents a bushel as alfalfa hay is selling for in dollars a ton. In other words, if alfalfa is selling for $15 a ton, the feeder can afford to pay 15 cents a bushel for potatoes.

Because potatoes differ from most feeds in both composition and form they require special methods of feeding. Water makes up 80 per cent of a potato and the remainder is mostly starch. It is low in protein, minerals and vitamins A and D and should be fed as only part of a well-balanced ration. Good quality alfalfa hay will supply these deficiencies in most cases.

Frozen or rotten potatoes should not be fed as they contain substances which may be injurious to livestock. Sprouted and green tubers should not be fed because they carry a poisonous substance called solanin.

Potatoes should be introduced into the ration slowly and the animals watched closely for scouring or digestive disturbances. Chopping the tubers with a spade or power chopper is recommended for all livestock except sheep, which can take them either way. Chopped potatoes give more economical gains and are less likely to cause choking. Cooking is desirable only when the spuds are fed to hogs.

Chopped, raw potatoes may be fed successfully to either fattening cattle or breeding stock. At least two-thirds of the ration should consist of alfalfa hay so that vitamins and protein are supplied. Not more than 3 or 4 pounds a head daily should be fed at first, but this amount can be increased gradually until at

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the end of 10 days an average size steer is getting 15 to 20 pounds. Smaller animals should receive proportionately less.

The Idaho experiment station recommends feeding fattening animals the following ration daily for each 1,000 pounds of live weight:

Grain	8 to 10 pounds
Alfalfa hay	15 to 20 pounds
Potatoes	15 to 20 pounds

The grain can be left out of a ration for wintering beef cattle.

A little more care and individual attention is required for dairy animals since they may be thrown off feed easily. The animals should be fed in stanchions, and at the first sign of thin manure or bloat the quantity of potatoes being fed should be cut down. Jerseys and Guernseys will take 15 to 20 pounds of chopped tubers daily, and the larger breeds, such as Holsteins, 20 to 25 pounds when full feed is reached. They should be started on the tubers gradually.

Alfalfa hay should be fed to supply protein and vitamins. Phosphorus needs can be taken care of by adding 2 per cent steamed bone meal to the grain mixture. Potatoes may be substituted freely for the silage, but not more than 3 pounds of the two combined should be fed for each 100 pounds of live weight. Molasses and other laxative feeds should not be given with the potatoes. Fed in proper amounts and with care, potatoes will not affect quality of dairy products.

Small quantities should be fed at first and the amount increased until lambs are receiving from 1 to 2 pounds a day. A well-balanced ration should also include 2 pounds of alfalfa and 1 pound of grain such as barley. Pregnant ewes should be fed 2 pounds of potatoes and 4 to 6 pounds of alfalfa until lambing time and after that 4 pounds of tubers daily. At this time ½ to 1 pound of grain should be added to the ration.

Potatoes may be substituted for as much as half of the grain in a hog ration. Along with these should be fed a protein supplement such as tankage, skimmilk or buttermilk. If none of these is fed, calcium should be supplied in a mineral mixture of 2 parts ground oyster shells and 1 part salt, included as 1.5 per cent of the grain mixture. Alfalfa meal should be included in the ration or alfalfa hay made available.

Cooking is advisable because raw tubers have only two-thirds the feeding value of cooked ones. Add salt to the cooking spuds and drain off the water when they are done.

Two to four pounds of potatoes should be fed for each pound of the following grain mixture: 83 pounds grain, 12 pounds tankage, 5 pounds ground alfalfa.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst.to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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